NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

COMPARISON OF THE PRICE AND VOLATILITY OF CURRENT AND ALTERNATIVE MODELS FOR THE ACQUISITION OF DIRECT SUPPLY NATURAL GAS FOR THE DEPARTMENT OF DEFENSE

by

Margot Haycook

June 2005

Thesis Advisor:	Roxanne Zolin
Second Reader:	Nayantara Hensel

Approved for public release; distribution is unlimited

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.			
1. AGENCY USE ONLY ***(Leave blank)***	**2. REPORT DATE** June 2005	**3. REPORT TYPE AND DATES COVERED** Master's Thesis	
4. TITLE AND SUBTITLE: Comparison of the Price and Volatility of Current and Alternative Models for the Acquisition of Direct Supply Natural Gas for the Department of Defense			**5. FUNDING NUMBERS**
6. AUTHOR(S) Haycook, Margot			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			**10. SPONSORING/MONITORING AGENCY REPORT NUMBER**
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited			**12b. DISTRIBUTION CODE**

13. ABSTRACT (maximum 200 words)

The Department of Defense (DoD) is the largest user of energy in the nation. DoD utilizes the Defense Energy Support Center (DESC) to procure a large portion of its natural gas. In this study it will be determined if the current buying approach utilized by DESC or an alternative approach present a better method to reduce the pricing risks associated with market timing and volatility. In order to determine how market timing and volatility affect purchasing, historical data for actual monthly prices of the current program and data from market pricing indices for a statistical model were analyzed. The data for the current model and the statistical model were compared using averages prices and standard deviation to determine which model provided better overall results. The analysis proved that by entering the market to purchase natural gas more frequently and using firm fixed price contracts results in an overall lower average price with less variability than using the current method of purchasing. This study recommends that DESC consider a pilot program, beginning in the northeast region, where the current purchasing model produces the most volatility in pricing, to develop a procurement program which will support stabilized pricing for its DoD customers.

14. SUBJECT TERMS Natural Gas Pricing, Defense Energy Support Center, Utility Pricing			**15. NUMBER OF PAGES** 81
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UL

NSN 7540-01-280-5500 Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-1

THIS PAGE INTENTIONALLY LEFT BLANK

Approved for public release; distribution is unlimited

COMPARISON OF THE PRICE AND VOLATILITY OF CURRENT AND ALTERNATIVE MODELS FOR THE ACQUISITION OF DIRECT SUPPLY NATURAL GAS FOR THE DEPARTMENT OF DEFENSE

Margot Haycook
Civilian, Defense Energy Support Center, Ft. Belvoir, VA
B.S., University of Laverne, 1995

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
June 2005

Author: Margot Haycook

Approved by: Roxanne Zolin
Thesis Advisor

Nayantara Hensel
Second Reader

Douglas A. Brook
Dean, Graduate School of Business and Public Policy

THIS PAGE INTENTIONALLY LEFT BLANK

ABSTRACT

The Department of Defense (DoD) is the largest user of energy in the nation. DoD utilizes the Defense Energy Support Center (DESC) to procure a large portion of its natural gas.

In this study it will be determined if the current buying approach utilized by DESC or an alternative approach present a better method to reduce the pricing risks associated with market timing and volatility.

In order to determine how market timing and volatility affect purchasing, historical data for actual monthly prices of the current program and data from market pricing indices for a statistical model were analyzed. The data for the current model and the statistical model were compared using averages prices and standard deviation to determine which model provided better overall results.

The analysis proved that by entering the market to purchase natural gas more frequently and using firm fixed price contracts results in an overall lower average price with less variability than using the current method of purchasing.

This study recommends that DESC consider a pilot program, beginning in the northeast region, where the current purchasing model produces the most volatility in pricing, to develop a procurement program which will support stabilized pricing for its DoD customers.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

LIST OF FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

ACRONYMS

CICA:	Competition in Contracting Act
C/I:	Commercial and Industrial
DEPPM:	Defense Energy Procurement Policy Memorandum
DESC:	Defense Energy Support Center
DESC-A:	Defense Energy Support Center, Installation Energy
DFAR:	Defense Federal Acquisition Regulation
DLA:	Defense Logistics Agency
DoD:	Department of Defense
DSNG:	Direct Supply Natural Gas
FAR:	Federal Acquisition Regulation
LDC:	Local Distribution Company (utility)
NAESB:	National Association of Energy Standards Board
NG:	Natural Gas
NGCP:	Natural Gas Competitive Procurement
NYMEX:	New York Mercantile Exchange, the organization that provides the market for trading of commodity futures and options

THIS PAGE INTENTIONALLY LEFT BLANK

DEFINITIONS

Arbitrage: Buying a futures month on one exchange and selling the same month on another Exchange by buying both sides involving the same commodity.

Basis: The transportation charge associated with moving natural gas throughout the country. Commonly based on the "wholesale" price of natural gas in Henry Hub, Louisiana. (Pace X)

Burnertip: The point where gas is consumed.

Citygate: The point at which gas is received into the LDC distribution system

Deregulation: The process of decreasing or eliminating government regulatory control over industries and allowing competitive forces to drive the market.

Forward Pricing: Negotiating a price with the supplier based on the NYMEX price plus or minus the difference in gas value, between the wholesale market where the supplier intends to take ownership of the gas, and the Henry Hub in Louisiana where the NYMEX contract is traded. (See I pg 5)

Futures Contract: A supply contract between a buyer and seller whereby the buyer is obligated to take delivery and the seller is obligated to provide delivery of a fixed amount of commodity at a predetermined price and location.

Gathering System: A system of small pipelines that collects gas from individual wells for delivery to a mainline system.

Hub: A physical location where multiple pipelines interconnect and where buyers and sellers can make transactions

Line Item: The four digit basic numbering scheme associated with each installation in the schedule

Mainline System: A gas pipeline normally operating at pressures greater than 60 pounds per square inch, transporting gas from other mainline lines or gathering systems to lower pressure distribution and local transmission systems. Also known as a transmission line or backbone system.

Market-based or index pricing: An offer for natural gas at a price that is tied to one or more natural gas market benchmarks or indicators. Some of these are Natural Gas Intelligence, Gas Daily and NYMEX. This type of pricing generally fluctuates and follows the current market price of gas over the life of the contract. (Glossary of Terms Nicor Inc.)

Market Center: A physical location where buyers and sellers make transactions (this may or may not also be a hub)

Marketer: An entity that buys and sells gas and arranges for its transportation for parties to whom it sells gas.

Producer: An entity that operates wells to bring gas that from reservoirs into the gathering system.

Spot Market: The short-term market for natural gas.

Swing Provision: During the month of delivery the Government may under or overconsume the quantity specified in its order by 10 percent. The contract price applys to all quantities consumed within the allowed 10 percent variation of the monthly order.

Well: The hole drilled into the earth's surface to produce natural gas.

Wellhead: The point where gas is pumped from the reservoir and enters the gathering system.

ACKNOWLEDGMENTS

Huge thank you goes to all of the following people who mentored and encouraged me; Pam Griffith for generously allowing me to complete this course of studies and suggesting the topic for this thesis, Mark Valavanis and Scott Taetsch without whom I would not have had data for the alternative model, Dr. Zolin and Prof. Hensel who encouraged me to keep improving my work. Without the support of my family, who understood all of the lost time together; Meagan and Amanda who allowed mom nine weeks away from home to complete my studies. Steve, you were my rock and helped with all of the formatting.

THIS PAGE INTENTIONALLY LEFT BLANK

I. COMPARISON OF THE PRICE AND VOLATILITY OF CURRENT AND ALTERNATIVE MODELS FOR THE ACQUISITION OF DIRECT SUPPLY NATURAL GAS FOR THE DEPARTMENT OF DEFENSE

A. INTRODUCTION

The Department of Defense (DoD) is the largest user of energy in the nation consuming nearly three-quarters of the energy used by the Federal Government according to the U.S. Energy Information Administration (EIA). It is, therefore, in the Government's best interest to find the best way to manage its energy procurement programs. Defense Energy Support Center (DESC) is DoD's primary procurer of natural gas. The Natural Gas Competitive Procurement Program (NGCPP) seeks to obtain a cost-effective supply of natural gas for DoD installations while maintaining supply reliability. The term DoD installations refers to all Army, Navy/Marine Corps and Air Force military bases located in the United States and will hereafter be referred to as "installations".

Since the Program was established in 1990 the market has continued to evolve and DESC recognizes the need to find innovative ways to engage the commercial marketplace in its procurement program to capture the changes in technology and market structure. Commercial private sector procurement practices adapt to the ever changing energy market and its technological innovations while the DESC Program has been slower to make changes since its inception.

Structuring DESC's procurement program requires recognition of the changes that deregulation have brought to the marketplace. DESC has three problems to deal with in buying natural gas. They are---

- how to **structure the best supply arrangements** to match energy needs in the most economic fashion,
- how to **achieve the best** bid for lowest cost supply at any given time and;
- how to **choose the best timing** of procurement commitments so as to mitigate risk and assure attractive average prices.

DESC, in the past, has focused on the second issue (the best bid), because the first and third (structure and market timing) require a new paradigm for DoD and an enterprise

approach to energy management rather than just meeting individual installation procurement objectives. This thesis will demonstrate how alternative procedures and strategies can overcome the issues of structure and market timing.

Currently, DESC is under contract with 31 marketers of the more than 2601 existing in the industry as of the year 2000 who provide direct supply natural gas to 2102 installations/and or Federal Civilian buildings in the natural gas program. It is DESC's goal to provide contracting opportunities that encourage competition yet mitigate the price risk associated with the volatility in the marketplace in order to provide natural gas to DoD and Federal Civilian Agencies through the use of DESC's Natural Gas Competitive Procurement Program.

B. RESEARCH OBJECTIVE

DESC commissioned a study to determine strategies for the procurement of natural gas and electricity in 2001.3 This study proposed an approach utilizing a "diversified portfolio" and stabilized pricing to meet the "…aggregated DoD requirements…" in predetermined areas or geographic regions. The objective of this thesis is to test if this diversified portfolio approach does offer installations a practical solution to reduce price volatility to meet the needs of DoD for it's Natural Gas Competitive Procurement Program.

C. RESEARCH QUESTION

1. Primary Research Question

Will the use of a price diversification program mitigate price volatility in the DESC Natural Gas Procurement Program?

2. Secondary Research Questions

- Do purchasing long term contracts via a monthly index support DoD's goals to reduce energy costs?

---

1 Based on Energy Information Administration data for the year 2000.

2 Program data from current contract databases for the Installation Energy Program at DESC.

3 U.S. Department of Defense, Defense Logistics Agency, Defense Energy Support Center, Under Purchase Order No. SP0600-00-D-5017, Delivery Order No. 0013, Alternative Electricity and Natural Gas Procurement Strategies For U.S. Department of Defense Installations by Exeter Associates, Inc. pp. 1-28, July 2001

- What is the current methodology for purchasing natural gas used by private industry for commercial and industrial customers?
- How can public sector purchasing programs capitalize on private sector best practices?

D. ORGANIZATION

This thesis will include:

- A review of past and current Government procurements of DSNG
- An examination of DESC's current DSNG purchasing strategies
- An examination of commercial purchasing strategies
- Development of models to compare the current strategies to an alternative price mitigation model
- Conclusions and recommendations

Chapter II - BACKGROUND discusses current commercial market structure of natural gas markets. This chapter concludes by discussing how private industry structures supply arrangements, secures best price and timing of procurement commitments to mitigate risk and assure attractive average pricing.

Chapter III – DESC PROCUREMENT PROGRAM discusses the current DESC natural gas procurement program strategies, some of the constraints faced by public sector contracting and the state of the current program.

Chapter IV – DIVERSIFIED PORTFOLIO MODEL examines the diversified portfolio model and enterprise approach to energy management with emphasis on the constraints and objectives of this model.

Chapter V – METHODOLOGY this chapter creates models to test the attributes of the diversified portfolio model on five years of historical data from the DESC natural gas program. Assumptions made to implement the model will be identified.

Chapter VI – RESULTS this chapter will analyze the data from the two models and prove or disprove its viability for DESC.

Chapter VII – CONCLUSIONS analyzes the steps necessary to incorporate the diversified portfolio approach into DESC's natural gas purchase procedures and discusses the potential impacts to DESC, the Customers and the Marketers. Research questions are answered and conclusions are summarized.

E. METHODOLOGY

This thesis research will include the following steps:

- Conduct a comprehensive literature search of Government reports and studies, magazine articles; Internet based materials and other library information resources.
- Review the DESC, Ft. Belvoir, VA procedures for purchasing natural gas
- Prepare models of current and proposed procurement procedure based on historical data

After compiling all data, it will be analyzed comparing the average prices and the standard deviation between the prices in each model to determine if either program will better avoid cost and produce a more stable price to the DoD for the purchase of natural gas.

F. EXPECTED BENEFITS OF THIS THESIS

This thesis will primarily benefit the DoD by determining if the price diversification model can be implemented and how an enterprise approach for DoD energy management supports viable options to purchase direct supply natural gas. The specific benefits will be the recommended implementation of a program that successfully mitigates price risk over the duration of the contracts "…without need for government procurement personnel to speculate as to when future gas procurement prices might be different from, and advantageous to, currently revealed future revealed market prices." 4.

This will enable DESC leadership to make strategic recommendations to the leadership of the Department of Defense Agencies on whether or not to pursue the diversified model approach and stabilized pricing as an alternative in its program.

---

4 U.S. Department of Defense, Defense Logistics Agency, Defense Energy Support Center, Under Purchase Order No. SP0600-00-D-5017, Delivery Order No. 0013, Alternative Electricity and Natural Gas Procurement Strategies For U.S. Department of Defense Installations by Exeter Associates, Inc. page 21, July 2001

II. BACKGROUND

A. INTRODUCTION

This background chapter begins with a review of natural gas marketing and its distribution channel. DESC's program and identification of the constraints, which affect the program, will be discussed. The chapter concludes with a description of the current practices in the private sector.

B. NATURAL GAS MARKETING

Natural gas marketing can be defined as the sales and distribution of natural gas. In even looser terms, marketing can be referred to as the process of coordinating, at various levels, the business of bringing natural gas from the wellhead to end-users. The role of natural gas marketers includes some vertical integration and is therefore quite complex, and does not fit exactly into any one spot in the natural gas supply chain. Marketers may be affiliates of producers, pipelines, and local utilities, or may be separate business entities unaffiliated with any other players in the natural gas industry. Marketers, in whatever form, find buyers for natural gas, ensure secure supplies of natural gas in the market, and provide a pathway for natural gas to reach the end-user. It is natural gas marketers that ensure a transparent market exists for natural gas. Marketing natural gas can include all of the intermediate steps that a particular purchase requires; including arranging transportation, storage, accounting, and basically any other step required to facilitate the sale of natural gas.[5]

1. Natural Gas Distribution Channel

Marketers are primarily concerned with selling natural gas, either to resellers (other marketers and distribution companies), or end users. On average, most natural gas can have three to four separate owners (Figure 1) before it actually reaches the end-user. In addition to the buying and selling of natural gas, marketer's use their expertise in financial instruments and markets to both reduce their exposure to risks inherent to commodities, and earn money through speculating as to future market movements.

---

[5] Natural Gas.org, Marketing, online at www.haturalgas.org/naturalgas/marketing.asp, accessed January 14, 2003

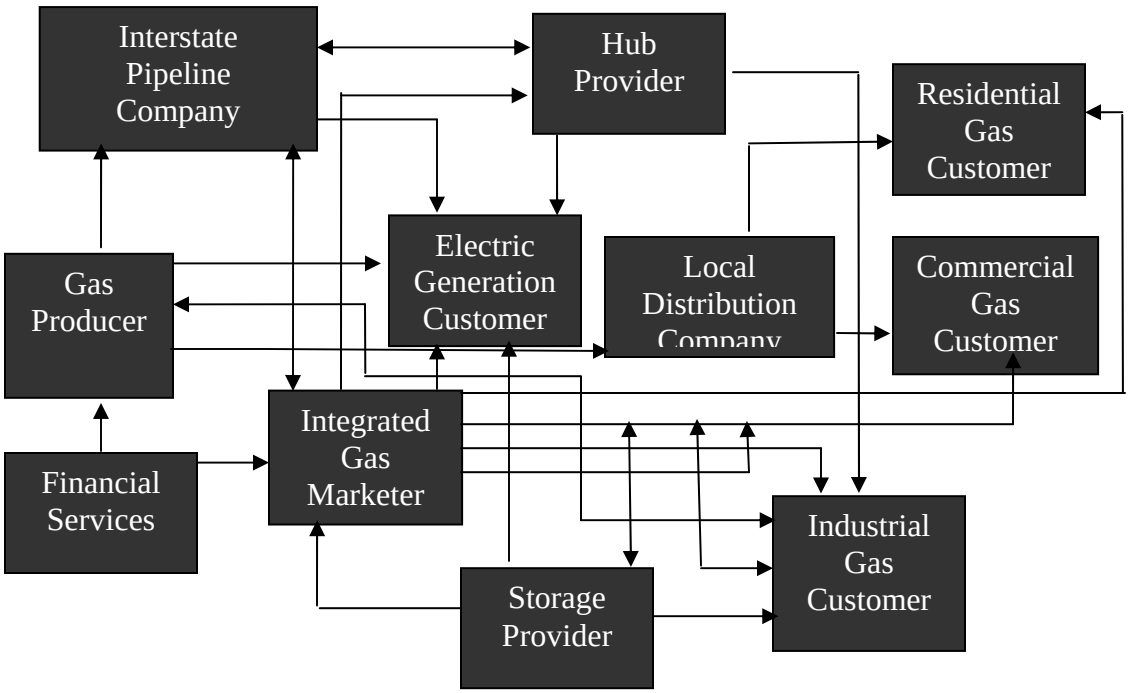


Figure 1. Competitive Delivery Chain

Participants in the Delivery Chain

Upstream Production:	Producers, gas processors, gathering pipelines
Midstream Transmission:	Interstate pipelines, marketers, financial houses
	Storage providers, hubs
Downstream Distribution:	Intrastate pipelines, LDC's

Enerdynamics LLC, copyrighted 2002, Gas Business Understanding

2. Natural Gas as a Commodity

Natural gas is sold as a commodity, much like pork bellies, corn, copper, and oil. The basic characteristic of a commodity is that it is essentially the same product no matter where it is located. Natural gas, after processing, fits this description. Commodity markets are essentially volatile; meaning the price of commodities can change often and at times drastically. Natural gas is no exception; in fact, it is one of the most volatile commodities currently on the market. Figure 2 shows typical components in the price.

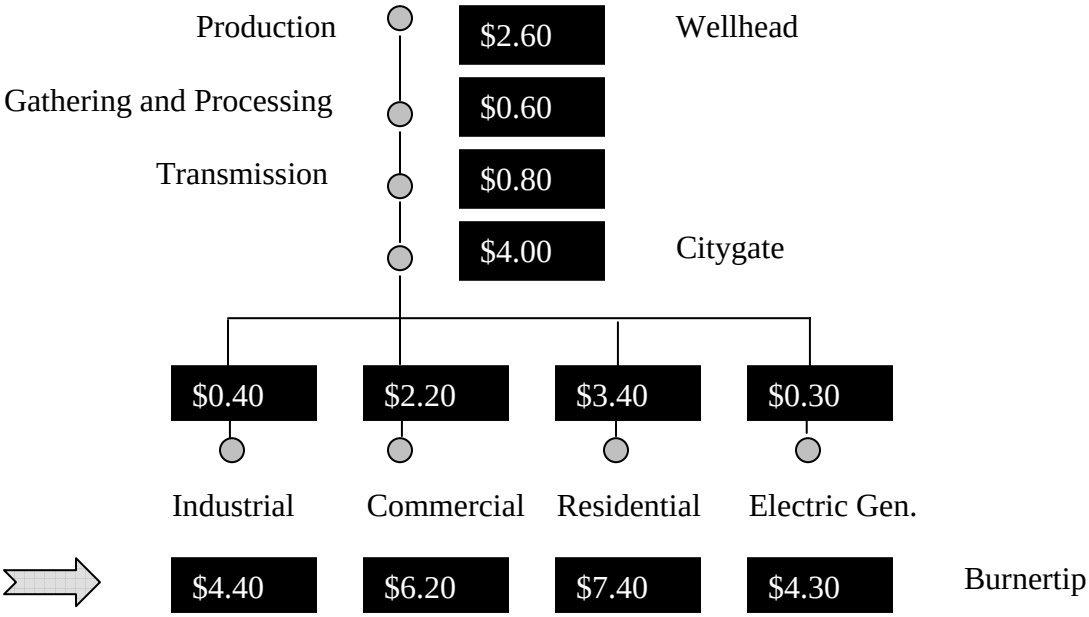


Figure 2. Natural Gas Value Chain

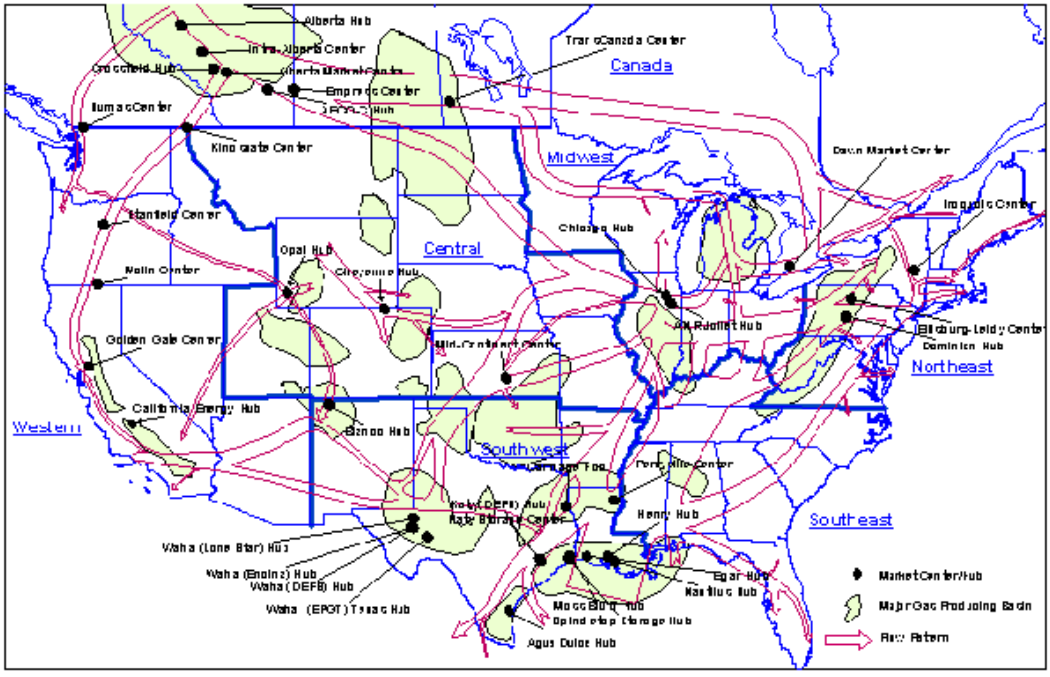
3. Pricing Natural Gas

The price of natural gas is set by market forces; the buying and selling of the commodity by market players, based on supply and demand, determines the average price of natural gas. There are two distinct markets for natural gas: the spot market, and the futures market. Essentially, the spot market is the daily market, where natural gas is bought and sold 'right now'. To get the price of natural gas on a specific day, it is the spot market price that is most informative. The futures market consists of buying and selling natural gas under contract at least one month, and up to 36 months, in advance. For example, under a simplified futures contract, one could enter into an agreement today, for delivery of the physical gas in two months time. Natural gas futures are traded on the New York Mercantile Exchange (NYMEX). Futures contracts are only one of an increasing number of derivatives contracts used in commodities markets, and can be quite complex and require a high level of knowledge and experience to understand.

4. Market Trading Centers

Natural gas is priced and traded at different locations throughout the country. Figure 3 identifies Natural Gas Centers across the United States. These locations, referred to as 'market hubs', exist across the country and are located at the intersection of major pipeline systems. There are over 30 major market hubs in the U.S. The principle market hub is known as the Henry Hub, located in Louisiana. The futures contracts that are traded on the NYMEX are Henry Hub contracts, meaning they reflect the price of natural gas for physical delivery at this hub. The price at which natural gas trades differs across the major hubs, depending on the supply and demand for natural gas at that particular point. The difference between the Henry Hub price and another hub is called the locational differential or also commonly called the 'basis'. In addition to market hubs, other major pricing locations include 'citygates'. Citygates are the locations at which distribution companies receive gas from a pipeline. Citygates at major metropolitan centers can offer another point at which natural gas is priced.

Figure 1. Natural Gas Centers/Hubs in Relation to Production Basins and Major Flow Corridors



Note: DEFS = Duke Energy Field Services Co; EPGT = EPGT Texas Pipeline Co.
Source: Energy Information Administration, GasTran Gas Transportation Information System, Natural GasMarket Hubs Database, as of August 2003.

Figure 3. Natural Gas Centers

C. COMMERCIAL PRACTICES

Commercial and industrial firms doing business in the private sector know that developing good procurement strategies for managing price fluctuations and risk is tantamount to success in saving energy dollars for their corporations. According to the E Source Industrial Service, a division of Platts retail and consulting arm, reporting in its "Gas Procurement Strategies for Volatile Times" study "…before 2000, energy end users seldom considered hedging practices as a means of protecting themselves against natural gas price volatility. " [6]

Industry realized after the dramatic price spikes in the winter heating seasons of the last few years that buying on the spot market left them exposed to extreme volatility in pricing. Companies that relied on national suppliers like Enron found themselves searching for other options in the wake of this energy giant's collapse. Some of the outcomes that they began to explore included reducing exposure to higher prices by reducing the overall volatility of price fluctuations. Instead of purchasing locally, large chains like McDonalds and Staples and others began strategizing nationally and buying locally. They learned that there were good reasons for developing a centralized, national strategy for gas procurement. Additionally, companies such as Johnson & Johnson learned that choosing a single supplier for all their facilities nationwide turned out to be a poor idea, especially since that supplier was Enron. Jon Engers of KTM said, "We recommend that end users do their hedging on a corporate level but arrange that physical delivery (through supply and delivery contracts) on a local level."[7.] A Wall Street Journal article 8 quoted Mr. Hernandez of PPG Industries, Inc. stating, "A change in natural-gas costs of $1 per million British thermal units equals a pretax-cost change of $60 million." When Mr. Hernandez went on to say that hedging had helped his company, it can be inferred that he meant that they were looking at options and opportunities to reduce some

---

6 Platts, Volatility and risk management strategize nationally, buy locally, US Natural Gas Guide, Gas Procurement strategies for volatile times, online: www.platts.com/features/usgasguide/gasprocrement.shtml accessed November 13, 2002

7 Ibid, pg. 2

8 Tom Locke, "PPG is Upbeat Despite Outlook For Auto Makers' inventory Cuts," Wall Street Journal, online: www.proquest.umi.com/pqdweb?TS=1051815956&RQT=309&CC=2&Dtp=1&Did=0000… accessed May 1, 2003

of this volatility in cost. Companies, like the ones mentioned above, are using a variety of risk reduction methodologies for price risk management. “As the shakeout continues in the U.S. wholesale energy marketing business…a dozen or so dominant companies are likely to emerge…set apart by sophisticated risk management systems, large and diverse portfolios of products and services, highly skilled marketing teams, and energy production assets…”[9.]

9 Enerdynamics LLC, “Gas Business Understanding, basic level”, presentation 2002 page 66.

III. DESC's NATURAL GAS PROGRAM

A. INTRODUCTION

Defense Energy Program Policy Memorandum (DEPPM) 91-1, issued October 17, 1990 assigned the mission of centralized acquisition of direct supply natural gas to Defense Logistics Agency (DLA), with DESC serving as the implementing agent. The follow-on memorandum, DEPPM 93-1, issued January 12, 1993, provides the most current operating procedures, guidelines, and management responsibilities for participants in DoD's direct supply natural gas program. Title VIII of the Federal Acquisition Streamlining Act of 1994 (Public Law 103-355) established acquisition policies "…more closely resembling those of the commercial marketplace and encouraging the acquisition of commercial items…" (FAR Part 12.000).

The mission of the DESC natural gas program, when established, was to provide quality service and support, lower installation's energy costs by saving money while maintaining supply reliability and providing for competitive procurements as mandated by the Competition in Contracting Act (CICA). The method adopted achieved the mission by aggregating geographic demand and managing supply, procurement, and transportation for natural gas customers.

B. RESPONSIBILITIES

In response to the DoD mandate for the acquisition of direct supply natural gas DESC is responsible for the consolidation of the installations' natural gas requirements as they are submitted by the Services.

1. Constraints

The FAR, DFAR and other agency level regulations put constraints on the strategies that DESC is able to employ in order to complete the mission and satisfy customer requirements for the supply of natural gas. Some of these constraints limit DESC's ability to utilize the best practices of the commercial marketplace when procuring natural gas contracts for the DoD. Consequently private-sector firm strategies, based on profits and return on investments, do not always mirror the public sectors strategies for competitive acquisitions.

a. Contract Duration

Government regulations and policies significantly constrain DESC by affecting the duration of contracts. The FAR limits DESC from entering into supply contracts for longer than 5 years. In private industry, 10-year contracts are entered into which result in lower average prices for the commodity.

b. Contract Funding

There is a lot of risk associated with the volatility of the price of natural gas for installations. They budget in their operations and maintenance funds for the commodities on the government's fiscal year (Oct – Sept). When prices vary, as they have in the last few winter seasons, and as they did during the Enron crisis, the Services and installations must find ways to reallocate funds from other programs to pay their energy bills. The crisis in California in the year 2000 required all of the services to rob Peter to pay Paul so to speak. The Marine Corps, with several bases in California, had to put some major military construction projects at various other locations nationwide on hold in order to pay for their utility obligations. I remember discussions in the contracting office I worked in at Quantico Marine Corps Base by the Public Works Officer and the Comptroller at that time about some of the Military Construction Projects I was working on being delayed in order to pay the utility bills at Marine Corps facilities in California. Additionally, several monthly invoice payments to marketers were not made on time as installations scrambled to find the funds to pay the bills.

c. Why Installations Choose Not To Utilize the DESC Program

The Services (Army, Navy/Marines, and Air Force) each have differing motivations when procuring natural gas for their installations. The Army, utilizing a consultant (Booz Allen), developed strategies to reduce some of their price volatility over this past years winter months. In coordination with the DESC's contracting office, negotiations were held with current marketers for several installations resulting in conversion of limited volumes of gas purchased for a firm fixed price rather than at the market index price. The same opportunities were offered to many other installations in a call letter[10] sent out by DESC but many did not choose to perform any price risk

[10] Email dated May 5, 2003 from Director, Installation Energy Mr. Jacob Moser, DESC subject: Notice to Nat Gas Customers, sent to all installations in the DESC natural gas program.

mitigation for their installations and instead purchased gas at market price. Installations choose not to convert some of their volumes to fixed-price for a variety of reasons. DESC has found that in some cases that the personnel at the installation do not understand the benefits of fixing a portion of their load and see it as a risk they would have to explain to their superiors if prices fall below the locked-in amount. Others do not want to deal with the administrative burden of determining quantities and lock-in prices and in many cases do not have the decision making authority to negotiate or set the terms of a conversion action. Some installations have the ability to alternate fuels, they have a secondary source, and in most instances they have the ability to switch to fuel oil or coal. This ability to switch is good for the individual installation in the short run but overall for DoD it is not always the most economical choice for energy use and cost savings. Fuel oil is purchased at a standard price established by DESC, if the price that was established in one year does not cover the cost of the actual commodity then the next year's standard price will reflect that difference. In the long run, staying with the price of the natural gas could potentially have been more cost effective than switching.

DoD has instructions, which mandate that Services utilize the DESC Program for the procurement of direct supply natural gas but there are exceptions, which permit the Services not to utilize the program (DEPPM 93-1). The exceptions include conditions when:

- an award is uneconomical when compared to the utility
- the local distribution company (LDC) does not provide transportation from the citygate to the end use customer
- ongoing or pending legal or regulatory action adversely impacts participation in the program
- the installation is impacted by base realignment and closure actions
- existing contractual arrangements with the LDC or with existing multi-year direct supply natural gas suppliers offer better prices or have termination liabilities exceeding DESC direct supply contract cost benefits.

d. No Centralized Procurement Approach

DESC accommodates Services' individual requests for the purchase of natural gas. Individual vice aggregated requirements are not always the most economically advantageous when viewed holistically. Separate contracts by Service, stem from the Services not looking to other Services that are located in the same region/area to combine their demand in attempts to obtain better pricing than could be gained individually. Similar to the Services desire not to aggregate demand across Service lines is the perception that aggregating demand will lead to cross-subsidization. Installations with high demand/usage for natural gas are less likely to partner with installations that have smaller usage amounts because the larger installations most likely will not realize the cost savings that the smaller installations will realize. So, larger installations have a perception that aggregating demand with smaller installations in the region is of no benefit. This limits the ability of smaller installations, and to some extent the larger installations, to bundle demand to obtain better pricing.

e. Voluntary Program

The last constraint to the Natural Gas Program is that DoD installations are not required to participate in the program. The decision of whether to participate or not is currently up to the individual installations thus the installations join the program based on whether they think that will obtain better pricing in the program or not. For DESC, this causes variability in demand from year to year within the regions that DESC has identified. This variability limits DESC from negotiating long-term contracts. If there were a mandate for all DoD installations to participate in the program, there would be a more stable demand from year to year and DESC could pursue longer-term contracts, which almost invariably lead to better pricing.

2. Limited Supplier Interest

DESC surveyed suppliers which were in the program in March and April 2003 resulting in a laundry list of reasons for a lack of interest in offering on government contracts. The first reason suppliers [11] gave for their lack of interest was the type of

[11] Summary responses were provided by the following: WGES-Mr. Kevin Anderson, CNE-Mr. Kevin Carey, Hess-Mr. David Walters, Bollinger-Ms. Meg Brundson, GasMark-Mr. Al Paulsa and MXEnergy-Mr. Bob Blake

contract DESC utilizes for its commodity purchases. DESC issues Requirements type contracts which in part state a maximum estimated quantity to potentially be ordered over the term of the contract when and if needed. Essentially, if the government did not want to order any commodity they are not obliged to do so but if they do order they are required to purchase only from the supplier under contract. This practice makes it impossible to hedge basis and causes many small suppliers to refrain from competing. Estimates of the risk premium imbedded in suppliers bids range from 5-15 cents. One supplier stated their experience with DESC gave them a competitive advantage in hedging this risk. The uncertainty of potentially zero monthly orders creates a barrier to competition. Suppliers use North American Energy Standards Board (NAESB) standard commercial contracts with addendums for agreements. The NAESB contracts are no where near the length or include the number of provisions included in DESC contracts.

Next, the suppliers were concerned about language in DESC contracts concerning interruptions of service requiring justification based on pipeline interruptions only. Most suppliers felt the justification included secondary delivery restrictions, but were still uneasy about having the provision in the contract. Suppliers all stated they interrupt customers much less often than the Pipelines interrupt (or restrict), but do not want to limit their discretion to interrupt in commercial contracts based on pipeline actions. Every supplier contracts with commercial customer based upon:

- Arbitrage. Generally a negotiated split at the time of interruption. Only Hess encourage putting terms of sharing in the contract. Every other supplier believed they could do better for the customers by having flexibility to respond to market conditions.
- Limited Days of recall. For every 10 days of recall (10-day, 20-day, and 30-day) an additional 5-6 cents is discounted on annual volumes. For non-recall days, price arbitrage is still available.
- Unlimited interruption at the discretion of the supplier. Arbitrage still available on certain days.

The 10% swing provision in DESC contracts is a problem for small marketers. Some will do it out of goodwill, but are reluctant to put it in the contract. The larger and more diverse the line items the less of an issue this becomes. Smaller suppliers will explicitly factor the swing into the price. Larger suppliers don’t see this as a problem they

have other assets that can be brought to bear. This issue may be the reason there are such large spreads in the bids. The cost was estimated at 5-15 cents on annual volumes. There are two common practices for pricing volumes outside the 10% swing: (1) negotiate a price, and (2) contractually using the average of daily cash price indices for the whole month.

Suppliers feel that the governments Prompt Payment Act payment terms are too slow. The Prompt Payment Act states that the government will pay the supplier no later than 30 days after receipt of a proper invoice and that if the government is late in payment they will include interest on the number of days late. Commercial practice routinely provides for payments in 15-20 days with the suppliers assessing a “late fee” if they are not paid within their terms.

One final area which concerns suppliers is the requirements that large business firms create a plan to make a goodwill effort to meet the federal governments subcontracting with socio-economic and disadvantaged business firms. This practice is one not routine in private industry and is arduous in the markets for natural gas as there are not many suppliers and or producers of natural gas who the large business have the ability to do business with.

IV. ALTERNATIVE NATURAL GAS PROCUREMENT STRATEGY

This chapter describes the diversified portfolio model as a procurement strategy for use by DESC in their gas market regions. This approach, which was prepared by Exeter Associates, Inc. for DESC as a strategy for natural gas procurement, is reproduced below and includes pages 17 through 28 of the report. The report was delivered to DESC in July of 2001.

A. Introduction

Purchasing each month's gas requirements at whatever price exists that month exposes the total acquisition cost to price risk. From month to month, if gas prices escalate, gas acquisition costs will escalate proportionately; if gas prices decrease, gas acquisition will decrease proportionately. On the other hand, purchasing all gas requirements at a single firm-fixed price, say under a one-year contract, would subject the total acquisition cost to the same proportionate risk of how the single one-year price compares to succeeding prices. The successful mitigation of price risk lay in a program that systematically purchases proportions of each period's gas requirements under several contracts covering varying lengths of time and ideally, entered into at systematically determined discrete points in time.

B. Natural Gas Acquisition Price Diversification Program

The principles of price diversification are incorporated in the following model natural gas acquisition program:

Divide the total annual gas requirements into four[12] pools, or "market baskets," each containing approximately 20 percent of the total requirement

Solicit a one-year, firm-fixed price for 80 percent of one market basket requirement;

Solicit a two-year, firm-fixed price for 80 percent of the second market basket requirement;

[12] Exeter report page 18 discusses the recommended five pools. Based on the availability of basis data for the model I have chosen to present this approach with four pools instead.

Solicit a three-year, firm-fixed price for 80 percent of the third market basket requirement;

Solicit a four-year, firm-fixed price for 80 percent of the fourth market basket requirement;

Solicit the remaining 20 percent of each market basket requirement at the monthly index price, as well as variations from expected gas requirements.

Continue to solicit gas requirements on a line item basis with supplier responsibility for balancing deliveries and end-user consumption.

This model program avoids the purchase of all gas requirements at one price, be it a monthly index or a single one-year price, or any other single price concept for a definite term. By avoiding a single price acquisition, price risk is mitigated resulting in greater price predictability and stability.

There is no single correct answer to what constitutes the amount of gas to purchase for various terms and at various points in time. Successful price risk mitigation lay in diversifying purchases to lessen reliance on any single or small set of prices and in maintaining the number of procurements at an administratively feasible level. If the number of separately solicited market baskets is too small, price risk will not be effectively mitigated. If the number of separately solicited market baskets is too large, each additional procurement will add to the associated administrative costs while the value of the additional diversification becomes less and less. The four firm fixed-price market basket procurements, along with a proportion of each procurement at current monthly prices, achieves price risk mitigation, and preserves an administratively feasible gas acquisition procedure.

The model recommendation to fix the price of 80 percent of each market basket load assures the procurement of a signification portion of the market basket load at current prices, while minimizing the probability that downward variances in gas consumption would reduce gas requirements below the amount of gas ordered a the firm fixed-price. To demonstrate the conservative nature of the firm fixed-price ordered for 80 percent of each market basket requirement, consider the LDC model. An LDC will plan its gas procurements to provide for expected requirements under normal weather and under weather conditions 10 percent colder and 10 percent warmer than normal. This is an extreme weather variation over an extended period of time. Even at that, gas requirements will vary by approximately plus or minus 8 percent under these extreme weather conditions. Limiting firm fixed-price order to 80 percent of expected gas requirements virtually assures that actual usage will exceed that amount, the excess being procured at the current month’s index price. Should

actual usage fall below 80 percent of the expected amount, the supplier simply sells the unused gas in the marketplace and credits purchased gas costs at the index price of gas on the days any such sales are undertaken.

Each line item proposal that is accepted results in one firm fixed-price for 80 percent of the load and the index price for the remainder of the load. Price diversity results, however, when each end-user in the program pays a price, which reflects the blended price associated with all acquisitions under the program.[13] The blending of the various prices and the rebilling of the total monthly gas procurement cost would be performed by DESC. The receipt and payment of supplier bills by DESC, and the rebilling by DESC to end-users, will be facilitated by end-user participation in the Defense Working Capital Fund arrangements.

An important aspect of the price risk mitigation program is the systematic achievement of price diversity. After the initial procurement at the start of the program, the amount of load that must be acquired each year is defined by the contracts reaching term each year. No longer will all gas requirements be subject to re-acquisition, and hence subject to whatever gas prices happen to be, at one time. The systematic approach diversifies price risk and avoids any need for speculating as to when natural gas procurements should be undertaken or avoided.[14] Diversifying price risk does not depend on "out-guessing" the market, the market, and the model price risk mitigation strategy outlined in this section avoids any programmatic need for government procurement personnel to speculate as to when future gas procurement prices might be different from, and advantageous to, currently revealed future market prices.

C. Advantages

When gas is procured on a systematic basis in accord with the model price diversification program outlined above, a number of advantages are obtained. While avoiding 100 percent reliance on current market prices for all gas procured, the program retains a 20 percent reliance on current market (index) prices. Thus, should the current market produce decreasing prices over time, 20 percent of total requirements will capture this beneficial effect, with an additional 20 percent of requirements (i.e., gas procured on a one-year, firm fixed-price basis) participating in that market

[13] For example, an end-user whose loads happen to be included in the four-year firm fixed-price basket would be subject to the risk of price changes over the ensuing for years, if required to pay only the four-year price for the 80 percent of its load solicited on a four-year, firm fixed-price basis.

[14] For example, any speculation that a springtime window of opportunity to procure gas supplies for the 2001-2002 winter was appropriate was inaccurate. Many future prices for the 2001-2002 winter were in the $4.80 to $4.85 range, whereas the earlier March and April futures prices were in the $5.00 to $6.00 range.

within a year. Similarly, should the market produce adverse price movements, only 20 percent of total requirements will be immediately affected, while the costs associated with firm fixed-price, various term contract requirements will lag the changes in market prices. The staggered end-dates of the various term purchases assures that varying proportions of the total annual gas requirement will be unaffected, for a time, by current changes in natural gas prices. In essence, under the price diversification program, the cost of gas supplies will be more stable and predictable than under a program where the cost of all gas acquisitions is affected immediately and proportionately with the change of gas prices. Price risk is mitigated and gas acquisition costs changes are moderated.

The price diversification program results in the periodic acquisition of that portion of natural gas procurements related to when the various contracts end. This is a systematic approach that results in natural gas solicitations for a predetermined amount of gas each year. DESC would be a participant in the gas acquisition market each year, but only for a predetermined amount of gas within a range based upon expiring contract amounts plus the on-going index-based purchases. Importantly, under the program, the amount of gas solicited each year is divorced from speculation and individual judgment as to how future gas prices might differ from future prices revealed in the marketplace. Each gas procurement will be at market prices, but short-term price movements will not affect total gas acquisition costs under the systematic application of program prescriptions.

To be successful, any gas acquisition program must be consistent with supplier expectations. There is little sense in soliciting gas under terms and conditions that are inconsistent with market operations and inconsistent with potential supplier interest. The structure of the gas acquisition market, knowledge of the features of gas procurements accommodated in that market and discussions with suppliers reveals that the price diversification program presented in this report will be accepted, in fact routinely expected, by potential suppliers in the marketplace. Suppliers routinely accommodate requests for firm fixed-price arrangements for a substantial portion of an end-user’s full requirements, with the gas volumes required to provide for differences between anticipated and actual consumption reflecting market prices at the time of delivery.

A practical standard against which an acquisition can be assessed is its consistency with the predominant behavior of other market participants. Firm fixed-price arrangements for a portion of total gas requirements have long been a feature of C/I (commercial & industrial) gas acquisitions. Indeed, the financial viability of large, gas-fired electric generation plants required long-term, known, stable gas costs as a condition for access to capital finance markets. Smaller commercial customers often fixed the

price of portions of their annual gas requirements, albeit a diminished portion more recently. However, smaller C/I customers are scrambling to rectify their recent over-reliance on spot marketed prices. Implementing a price diversification program is consistent with predominant, revealed, market participant behavior.

The diversification program presented herein provides flexibility needed for adjusting the portfolio of natural gas pools to accommodate changes in requirements over time. Lost loads can be excluded from, and new loads can be included in, gas acquisition solicitations that are occurring each year on an on-going basis under the program. Periodic review of the four market baskets comprising the portfolio of gas acquisitions will reveal any need to adjust the market baskets to retain approximate equality among the four gas pools. The periodic coincidence of several contract end-dates provides the opportunity to adjust the acquisition portfolios. Since ranges of portfolio component amounts are not unreasonable, strict adherence to the 20 percent market basket prescription is neither necessary, nor advised.

Finally, implementation of new procedures often is associated with program participant apprehension during the initial implementation period. To minimize participant concerns during the implementation period, the proposed program has been tailored to minimize the changes from existing acquisition procedures. The listing of end-user facility requirements for individual line-item proposals is continued under the price risk diversification program. Individual contractor balancing obligations is a procurement feature that is also continued. In fact, virtually the same solicitation procedures utilized in the current DESC monthly buy program are retained, save for the firm fixed-price feature for a portion of each end-user facility requirement, and the grouping of loads into four various term contract periods. The avoidance of wholesale changes to current procedures in order to achieve price diversity minimizes the areas of concern with program prescriptions.

D. Disadvantages

While the program prescriptions to achieve price diversity have been designed to minimize changes in the current DESC monthly buy program, end-users will see major changes in the determination of their monthly gas acquisition costs. Rather than see a direct determination of their monthly gas acquisition costs by receipt of supplier invoices for their line item

requirements, (or DWCF charges reflecting same), end-users will see a monthly cost based on a blend of all market basket costs, adjusted for sustained historical acquisition cost differences.[15]

Each year, after the initial year of implementing the price risk diversification program, the one-year gas supplies and at least one other term procurement supply will need to be solicited at the then existing market prices. Ideally, the gas supplies requiring solicitation each year should be subdivided into several, time-staggered solicitations. Each of the four market basket volumes is large enough to be broken down into several discrete amounts for individual solicitation. This procedure would increase the number of times that components of the gas supply portfolio are solicited, increase the number of market prices the gas being procured is subject to, and thus increase the resulting price diversification achieved. The disadvantage, of course, is the administrative cost of more frequent solicitations.

Under the program price diversity is achieved by eliminating the dependence of end-user individual line item loads on any single term-certain price or on each monthly cash price. Line item prices are blended. In essence, each end-user facility has a portion of its monthly gas requirements supplied at each acquisition cost incurred under the program. This, of course, results in a need to bill each customer at the blended price. Also, typical acquisition cost differences among end-users under traditional procurements should be retained. This billing function will require use of the Defense Working Capital Fund procedures by end-users, and will require DESC to incur administrative costs associated with the rebilling requirement.

Adoption of the price risk mitigation program will require the initial years' entire gas requirement to be procured in the current year. After the program is established, the staggered end dates of the various term purchases will assure diversity of prices on a continuing basis by subjecting only a portion of gas procurement prices to reliance on gas market conditions at any one point in time, initial procurements of each of the four market basket amounts of gas could be purchased during a different month prior to the starting month of deliveries. Gas prices can change quickly and significantly over relative short time periods. While a staggered solicitation in the initial year of the program can increase price diversity, it would include additional administrative requirements.

[15] The end-user line item solicitation feature is continued under the price risk diversity program in order to retain supplier-balancing responsibility. Individual end-user loads are too small to procure on a price-diversified basis. End users cannot be billed at individual line item supplier cost if price diversity is to be provided, as well as gas supplies to meet monthly requirements.

Finally, it is expected that the four-year gas procurement market will be "thinner" than the cash, one-, two-, and three-year markets. When the government accepts a proposed firm fixed-price, many winning suppliers are expected to purchase financial hedging contracts that have the effect of locking in their offered/accepted price, thus protecting their expected margin gains. There are reported futures prices for a three-year period, so virtually any marketer has good gas price information and access to hedging instruments in the up-to-three year market. Four-year firm fixed-prices do exist, but fewer suppliers operate in that market. Anecdotal information indicates that it is the larger, more sophisticated suppliers who participate in the beyond-three-year gas procurement market. Solicitation results will confirm the exact supplier interest in these long-term purchases.

E. Conclusions

The purchase of natural gas supplies in concert with the model program presented in this section of this report does, in fact, achieve both the procurement of required gas supplies and the mitigation of price risk attendant to the acquisition of a commodity whose price is subject to charges in an unknown direction and by unknown amounts. Specifically, the gas acquisition program outlined in this report achieves the following results:

Significantly reduces the dependence of total natural gas acquisition costs on any single price of gas that exists at the time of natural gas procurements;

By reducing reliance on any single price and including firm fixed-price acquisitions, acquisition costs are both more predictable and stable;

By purchasing portions of gas requirements each year at fixed prices and at index prices, a portion of the portfolio acquisitions costs will reflect current market prices;

By limiting purchases each year to only a portion of total annual requirements, the gas costs related to a portion of total annual gas requirements is insulated from current price movements;

The staggered end-dates of fixed term purchases assure that DESC will not have to enter the market for all of its gas procurements at any one time at whatever prices happens to exist at that time;

Implementation to the program diversification principles would replace the yearly procurement of virtually all gas requirements with yearly procurement of a portion of all gas requirements;

> By structuring procurements in a way that systematically requires the purchase of a portion of annual gas requirements every year, there is no need to speculate, or try and outguess the market, as to when gas should be procured;
>
> Because the program remains reasonable within ranges around the portfolio market baskets of loads, new or reduced gas loads can be accommodated within the purchases occurring each year;
>
> By providing for both the acquisition of gas supplies and the mitigation of price risk, DESC's gas procurement program would be consistent with LDC/Commercial/Industrial gas acquisition programs;
>
> The model program achieves price diversity with minimal changes to the structure of the current DESC natural gas solicitation instrument;
>
> In order for each participating installation to benefit from the diversification of price risk achieved under the program,, the average cost of gas acquired under the program, adjusted for any significant, revealed end-user price differences, should be allocated to participating installations; and
>
> The allocation of acquisition costs incurred under the program requires initial supplier invoicing of DESC and rebilling of participating installations. (*End of excerpt from Exeter Report to DESC)*

The natural gas market continues to evolve. Over the past several years, the market has developed into one in which both gas and price risk mitigation can be procured. The dramatic price increases in 2000, from $2 per MMBtu to in excess of $9 per MMBtu demonstrated the price volatility exhibited by this essential commodity. Responding to the demonstrated price volatility and its impacts on purchased gas costs, market participants are rapidly structuring their gas acquisition plans to procure natural gas under a program that also mitigates price risk. Adoption of a price risk mitigation program by DESC comports with current gas market opportunities and revealed market behavior.

The following section focuses on alternatives DoD can employ to capture some of private industries practices in mitigating price risk. Five-year historical demand data that is available for the installations in the program will be utilized in development of a

historical model of the DESC DSNG procurement program and then a second model will be developed which looks at a diversified portfolio approach to stabilized pricing. Comparison and contrast of these methodologies will be developed.

THIS PAGE INTENTIONALLY LEFT BLANK

V. METHODOLOGY

A. CURRENT NATURAL GAS PROCUREMENT MODEL

An evaluation was made of the actual gas consumption data available for the installations that participated in the DESC program. The data revealed approximately five years of historical consumption data was available for the years June 1999 through April 2005. The data was organized and grouped into the appropriate DESC gas-marketing regions, see Figure 3. The procurements for program 7.4a were not included as Alaska is a unique procurement area that is best benefited by serving it separately from this alternative approach. Inspection of the data matrix revealed that many installations were not customers for the full five years. Those installations that were not customers in all the years were purged from the matrix. There were 119 installations that were customers in all of the years, Appendix A identifies the installation name, location and program line item number. The installation, by line item number and delivery point, along with their Standard Index Prices (SIP) for June 1999 through May 2005 can be found in Appendix B. The SIP data was retrieved by accessing the Fuels Automated System (FAS) database for the Natural Gas Procurement Program, which is a web based program which stores monthly contract prices for each installation under the DESC natural gas procurement program. The monthly prices are established in the contracts for each installation and are based on indices published by Platts Research & Consulting in the Inside F.E.R.C's Gas Market Reports, for some locations the Natural Gas Intelligence (NGI) Weekly Gas Price Index was used.

B. ALTERNATIVE PROCUREMENT MODEL

This model uses the same 119 installations and SIPS locations under the current DESC program and incorporates the methodology described in Chapter IV. The only difference is the use of a four-basket approach vice a five-basket approach. This is due to the lack of comprehensive data on the NYMEX futures prices that are needed to forecast what historical prices would have been during timeframes when acquisition purchases would have needed to be made.

1. Assumptions

- The volume of natural gas purchased would affect the pricing of the commodity but would entail a much larger data set than is manageable therefore; this model assumes that the volumes in each market basket will be the same.
- The current program price called the "adjustment factor" includes components of direct and indirect costs for transportation, fuel loss, overhead & profit, taxes, etc. There is no way to determine what the actual costs for this "adjustment factor" would have been historically for the alternative model so for the purposes of comparison of the two models the adjustment factors will not be included in the analysis. Comparison will be made using the supply index price of the commodity only.
- The Exeter approach does not identify which locations or regions to put in each market basket, so the baskets created reflect the regions that currently exist in the program rather than a concern for equal volumes of gas for each basket.

2. Development of the Alternative Model

This model uses historical data for the development of what the "future" price of natural gas would have been on the NYMEX for the timeframes in Table 1. Actual market prices were determined from Platts Inside Ferc's Gas Market Report for the timeframe when a contract would have been in place. For Program 7.3 some of the prices were derived due to a lack of data for the complete timeframe covering the model. The method for derivation of the pricing was to take actual prices for April 1999 through March 2002 and forecast April 2002 through March 2003. This was done by first calculating the difference between the April 1999 to April 2000 price and so on month to month to March 2002 to determine the average increase in price. Then April 2002 through March 2003 were forecasted by adding the April 2001 price plus the difference from April 2000 and April 1999 to achieve the forecasted price for April 2002 to March 2003 (month to month).

C. CRITERIA FOR COMPARISON OF THE CURRENT AND ALTERNATIVE MODELS

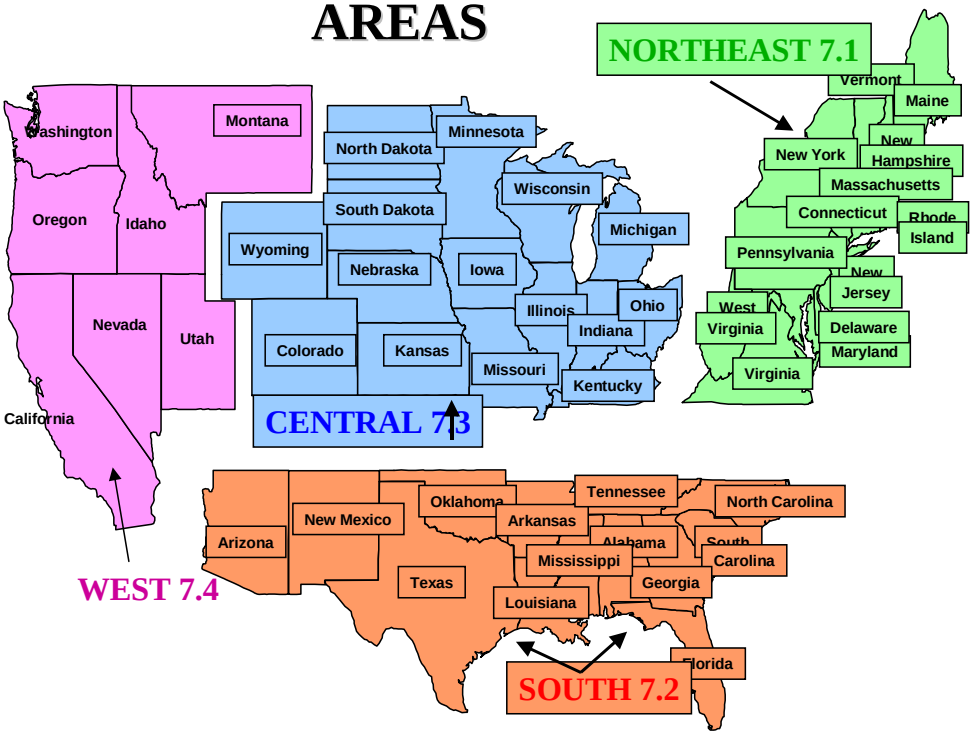
To determine if either model produced consistent results a method for analysis was developed. The average price for each series in each region for each model was compared to see which provided the lower price for that program. Average price only

tells one part of the story and over a three or four year pricing structure could result in an overall lower price without being consistently lower. The next step was then to determine the standard deviation in pricing for each series in each region which supported a determination of overall volatility in the price of the series.

Table 1 Timeline for Purchases Under the Alternative Procurement Model

The purchases in the alternative approach will be effective in the timeframes and for the Purchase Programs identified in Table 1.

NATURAL GAS PROCUREMENT AREAS



ALASKA 7.4a

Figure 4. DESC Natural Gas Marketing Regions

VI. RESULTS

A. INTRODUCTION

This chapter will compare and contrast both models and determine if the alternative approach is a viable method for procurement of natural gas for DoD. Charts will show how firm fixed-pricing over time results in a smoothing out of the prices. Standard deviation, average price and percentages of months when the alternative model outperformed the current program were calculated and are provided in Chapter VII. The statistical data was used to analyze the performance of each model and determine the volatility associated with each model.

B. RESULTS BY REGION

1. Program 7.1 Northeast Region

The northeastern region is historically one of the most volatile regions for pricing natural gas due to high variability in weather especially in the winter months and capacity constraints on the pipelines in the region. As the region has grown the pipelines have struggled to keep up with the ever-increasing demand for natural gas. As you can see in the charts for the northeast region on pages 32 and 33, use of the alternative approach would benefit all of the installations to some degree. As expected, the winter months show the greatest variation in pricing between the current and alternative models. Ninety percent of the time the alternative model outperformed the current program in pricing in this region. The average price of natural gas was consistently more than one dollar less than that paid under the current program. The standard deviation in price for the alternative model was lower than the current model for all installations and their corresponding pricing points. In three out of four pricing points, and all installations supported by them, the alternative program price only deviated by approximately 25 cents compared to about $1.50 for the current program. It is clearly evident that procurement of 2 year firm fixed-price contracts for approximately 80 percent of the installations volumes of gas would improve the overall cost avoidance for the DoD in this region.

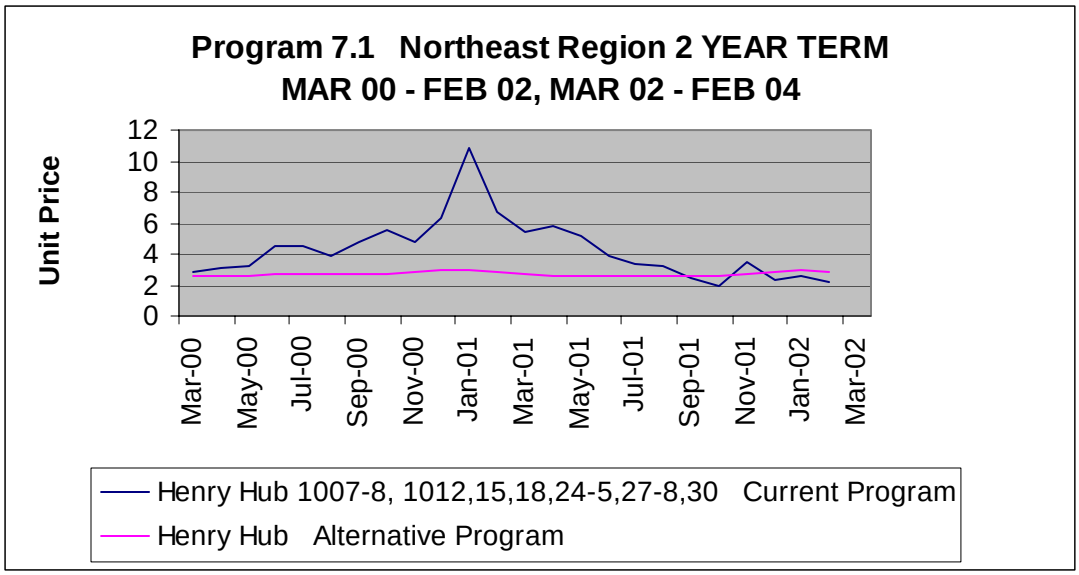


Table 2 Program 7.1 Northeast Region Model Comparison Henry Hub

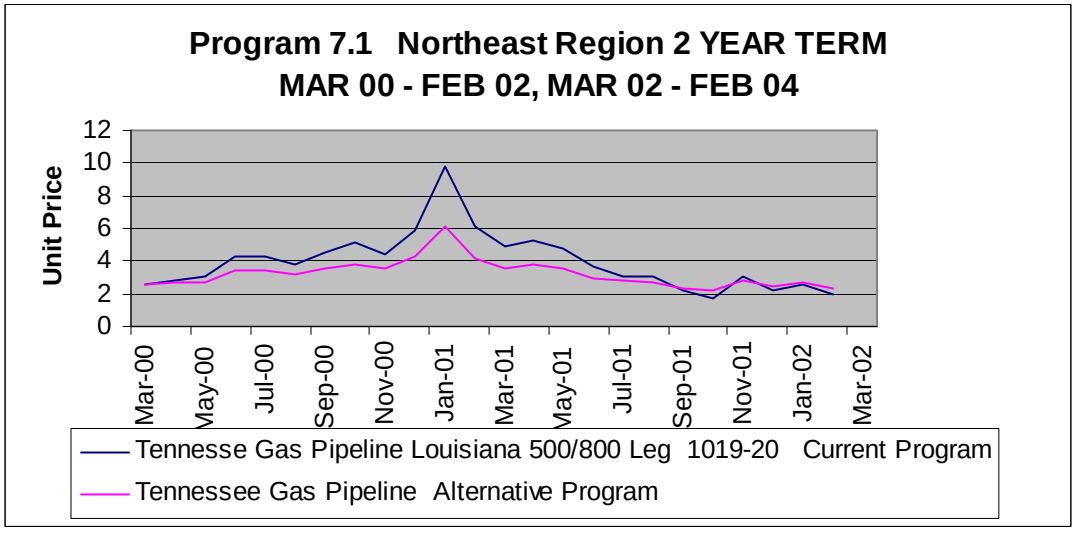


Table 3 Program 7.1 Northeast Region Model Comparison Tennessee Gas Pipeline Louisiana 500/800

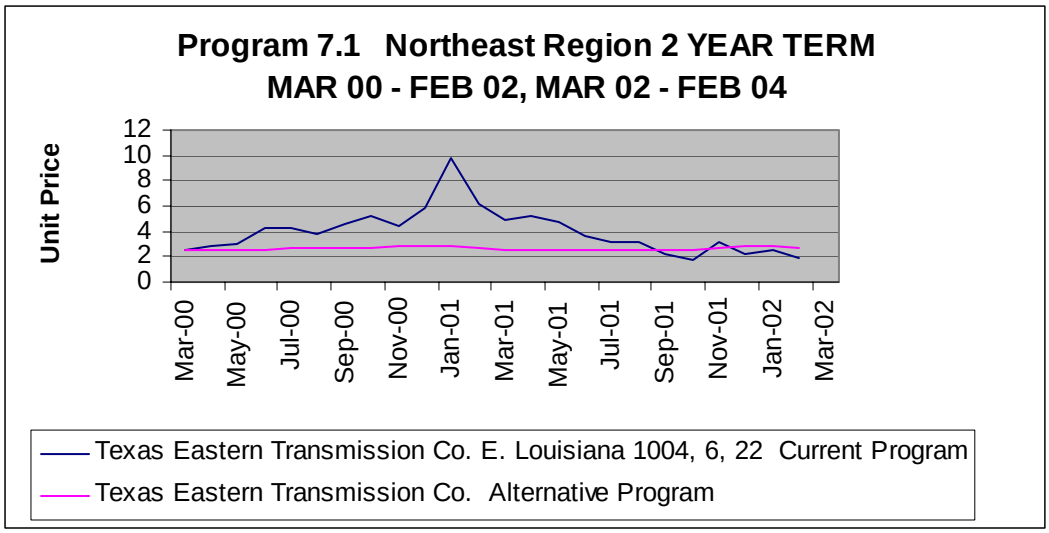


Table 4 Program 7.1 Northeast Region Model Comparison Texas Eastern Transmission E. Louisiana

2. Program 7.2 Southern Region

This region shows less variation in pricing than the northern region, see charts on pages 34 to 37. Weather is a mitigating factor in this region though major storms including hurricanes do have the potential to affect these areas and cause some degree of variation and some major spikes in the monthly index prices. This regions proximity to the major producing areas does reduce the potential volatility in pricing but this may be offset when major storms occur which can affect producers in the area. Entering into one year term contracts for this region result in the alternative model outperforming the current program in pricing in this region 63 to 79 percent of the time. The average price of natural gas was more than $1 less than that paid under the current program in all but one case where the difference was 94 cents. The standard deviation in price for the alternative model was lower in eight of the nine pricing indexes. The alternative model only deviated by approximately 25 to 33 cents compared to more than $1 for the current program. Again, overall the region can benefit from the alternative model even in this scenario where procurement is happening on an annual basis.

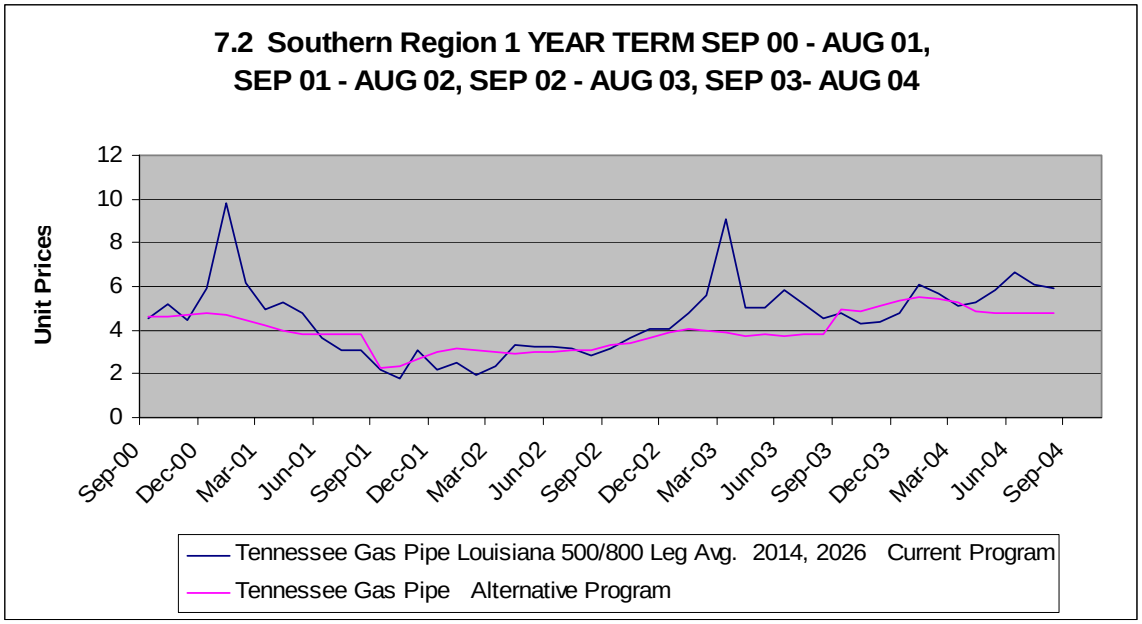


Table 5 Program 7.2 Southern Region Model Comparison Tennessee Gas Pipeline Louisiana 500/800 Leg

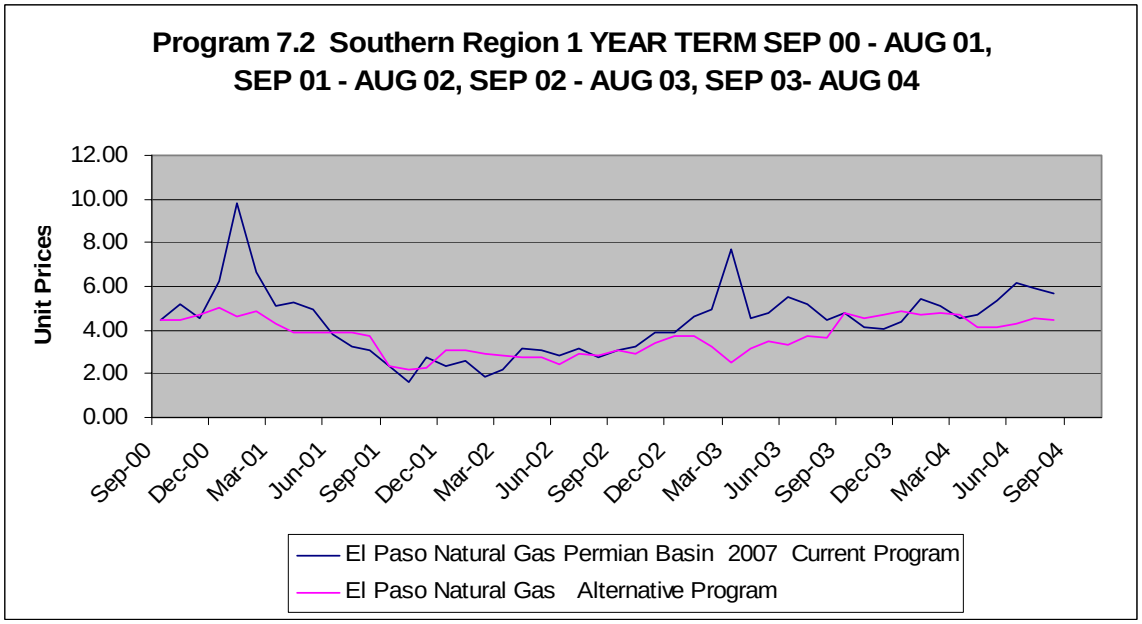


Table 6 Program 7.2 Southern Region Model Comparison El Paso Natural Gas Permian Basin

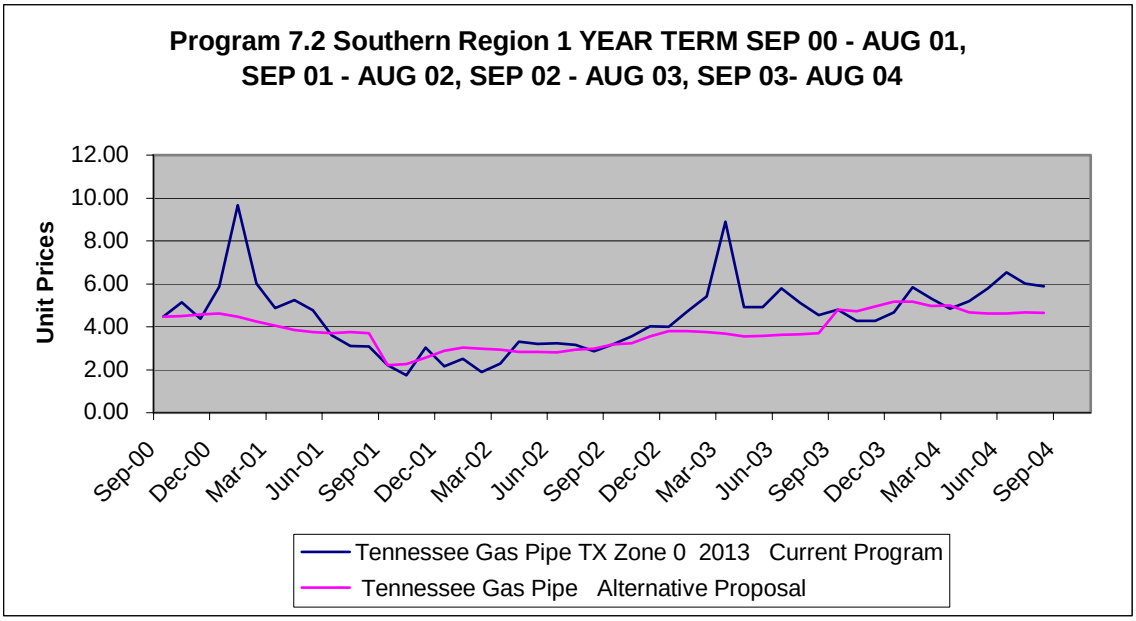


Table 7 Program 7.2 Southern Region Model Comparison Tennessee Gas Pipe TX Zone 0

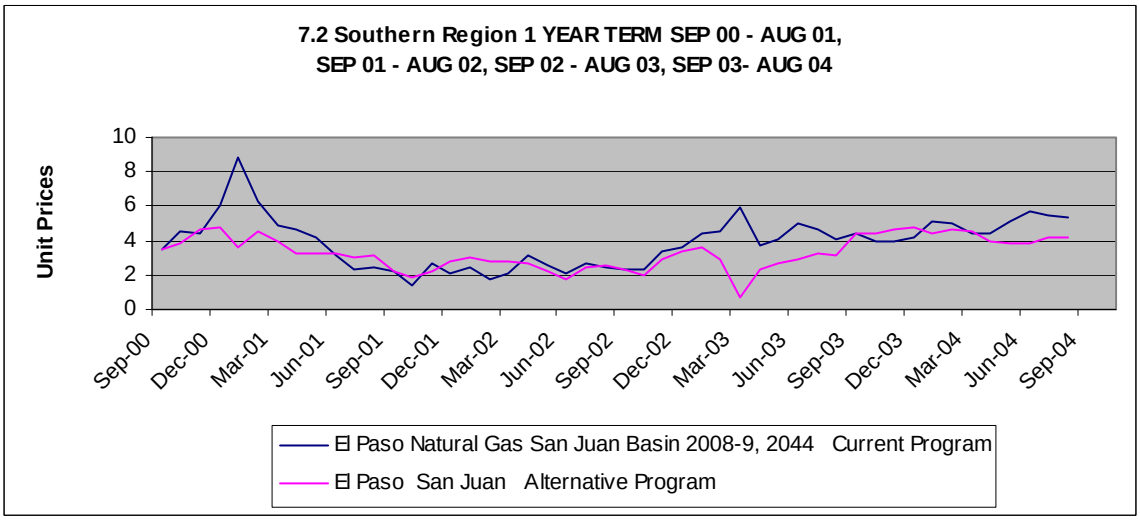


Table 8 Program 7.2 Southern Region Model Comparison El Paso Natural Gas San Juan Basin

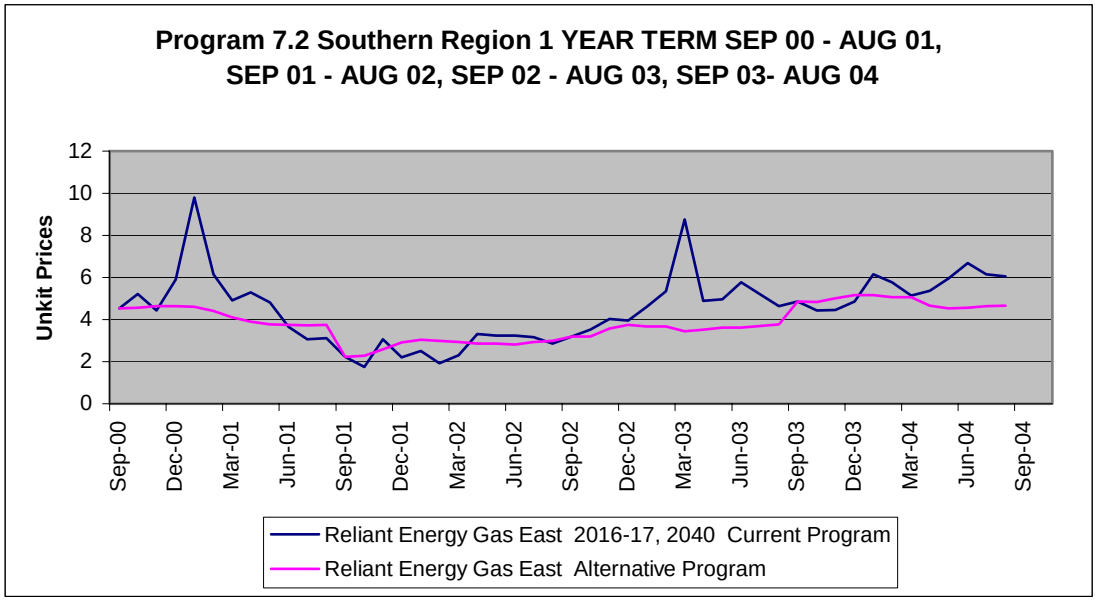


Table 9 Program 7.2 Southern Region Model Comparison Reliant Energy Gas East

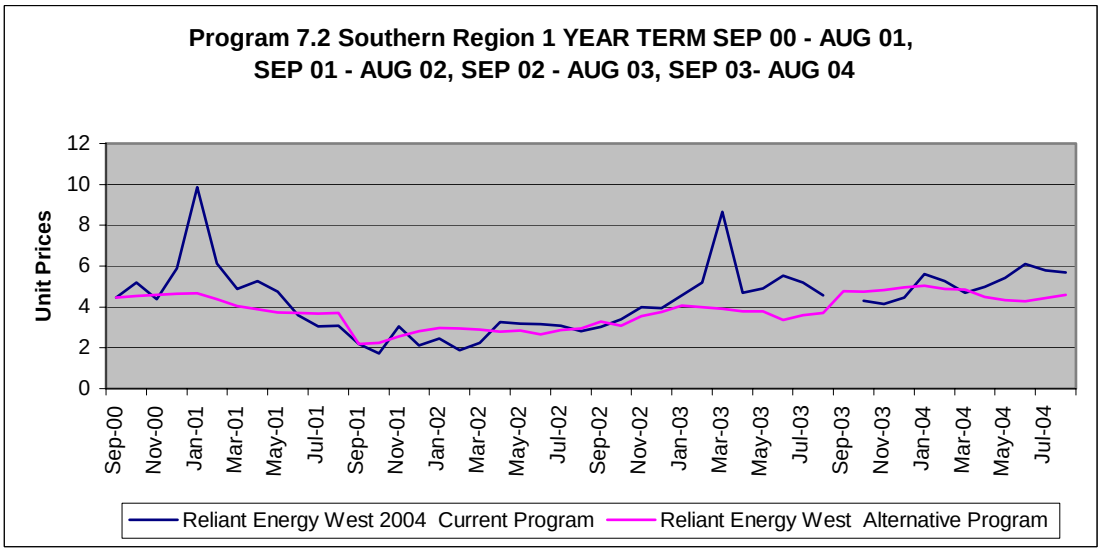


Table 10 Program 7.2 Southern Region Model Comparison Reliant Energy West

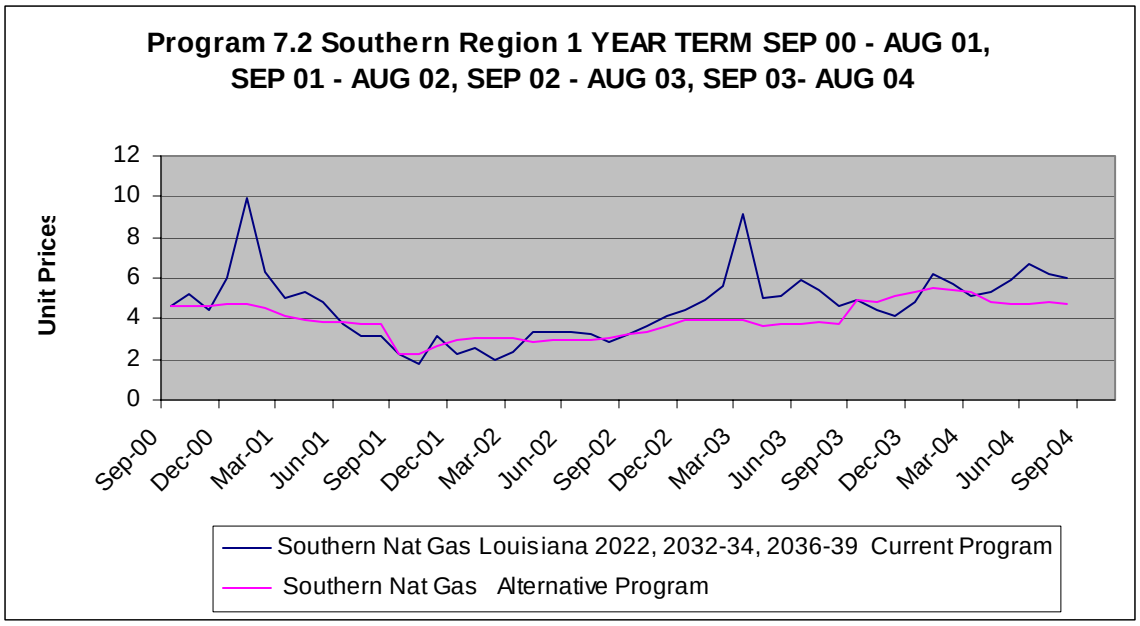


Table 11 Program 7.2 Southern Region Model Comparison Southern Natural Gas Louisiana

3. Program 7.3 Central Region

This region is subject to a great degree of weather variation in the winter months as is obvious as one looks at the charts for this region. This region would achieve cost avoidance by entering into firm fixed price contracts for the long term. A four year firm fixed-price procurement cycle was chosen for this region resulting in the potential for considerable cost savings had it been in force rather than utilization of the current program methodology. See the charts on pages 38 to 41. More than 70 percent of the time the alternative model outperformed the current one in pricing. The standard deviation in price for the current and alternative models is nearly the same but the average price of the alternative is still lower than the current model. There is less reliability in the out years of the alternative model since it is difficult to forecast prices that far into the future. On page 31 under Development of the Alternative Model I describe how the derived pricing was developed for the alternative model for region 7.3. The reliability of my model is suspect since it was developed years after the fact and the data was not all there to support the

price points for the futures pricing on the NYMEX indices. I therefore made assumptions about the price of gas in the future where there was not transparency in the models that is evident in the date starting approximately April 2003.

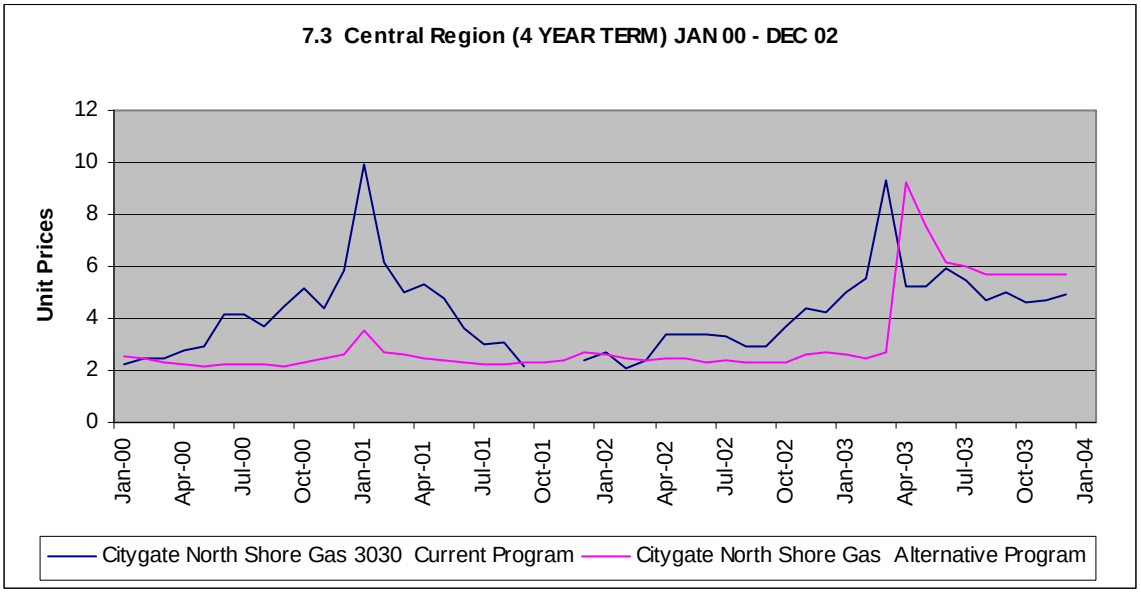


Table 12 Program 7.3 Central Region Model Comparison Citygate North Shore Gas Chicago Citygate

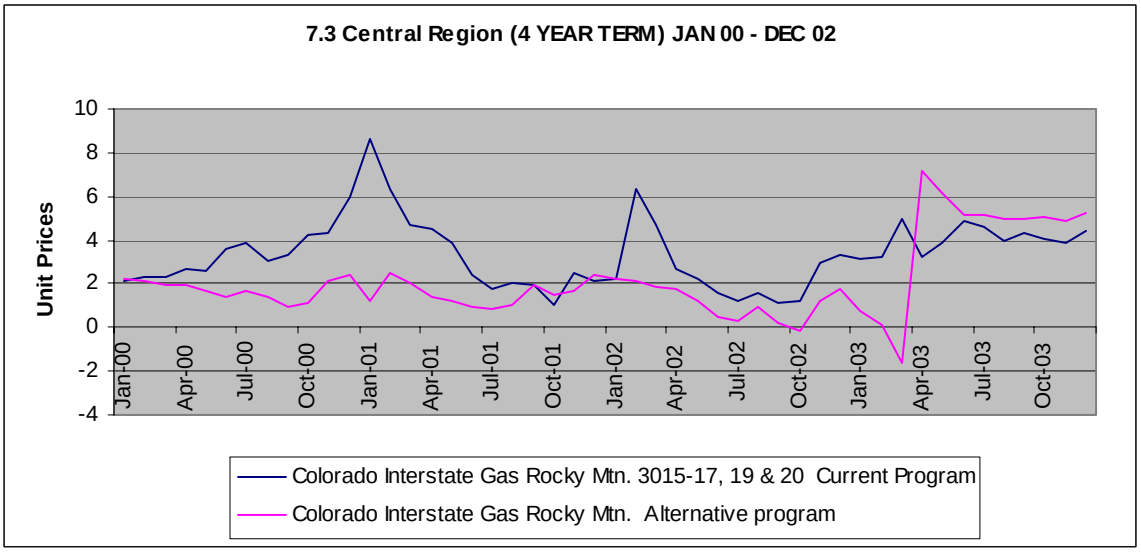


Table 13 Program 7.3 Central Region Model Comparison Colorado Interstate Rocky Mountain

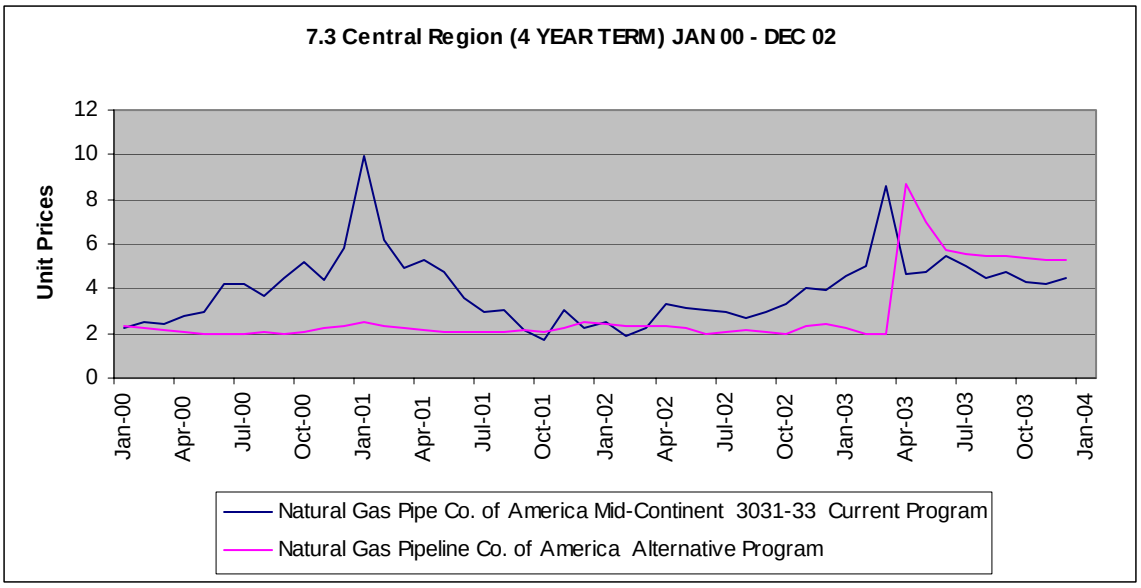


Table 14 Program 7.3 Central Region Model Comparison Nat. Gas Pipe Co. of Am – Mid Continent

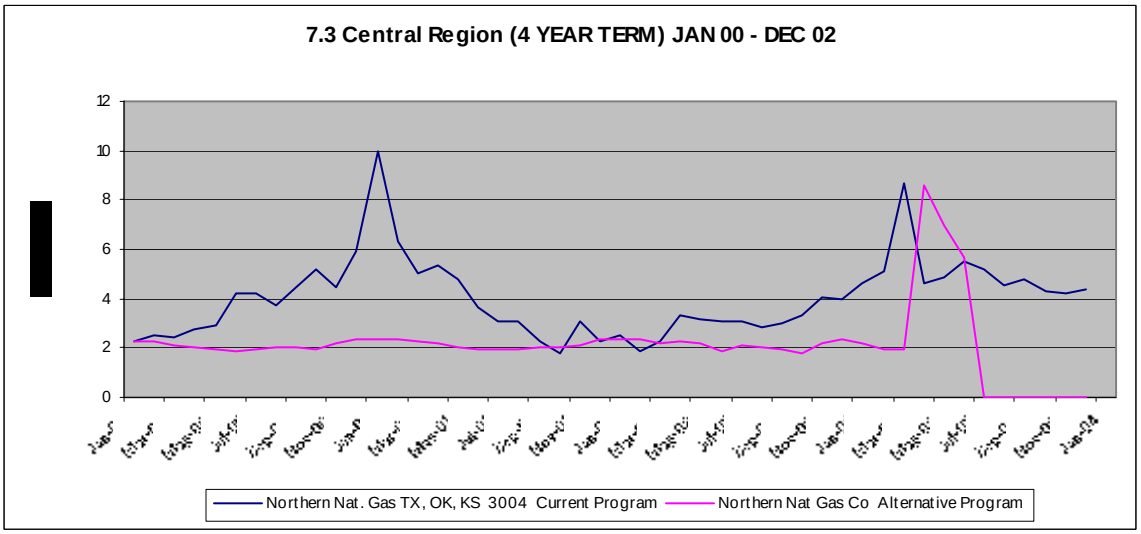


Table 15 Program 7.3 Central Region Model Comparison Northern Natural Gas TX, OK, KS

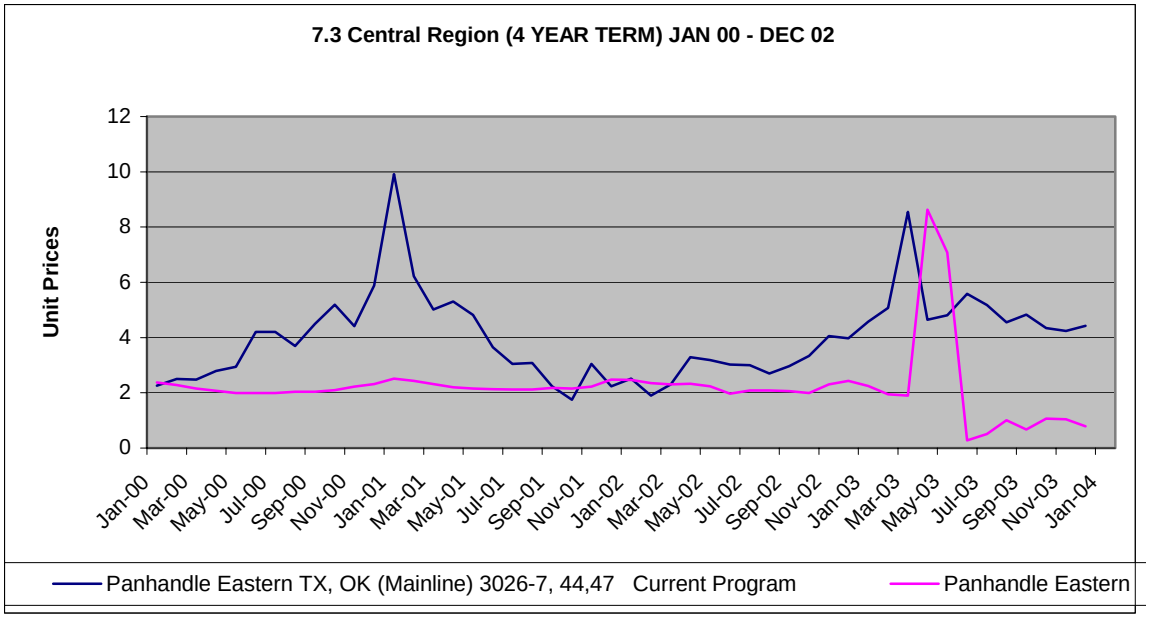


Table 16 Program 7.3 Central Region Model Comparison Panhandle Basin TX, OK (Mainline)

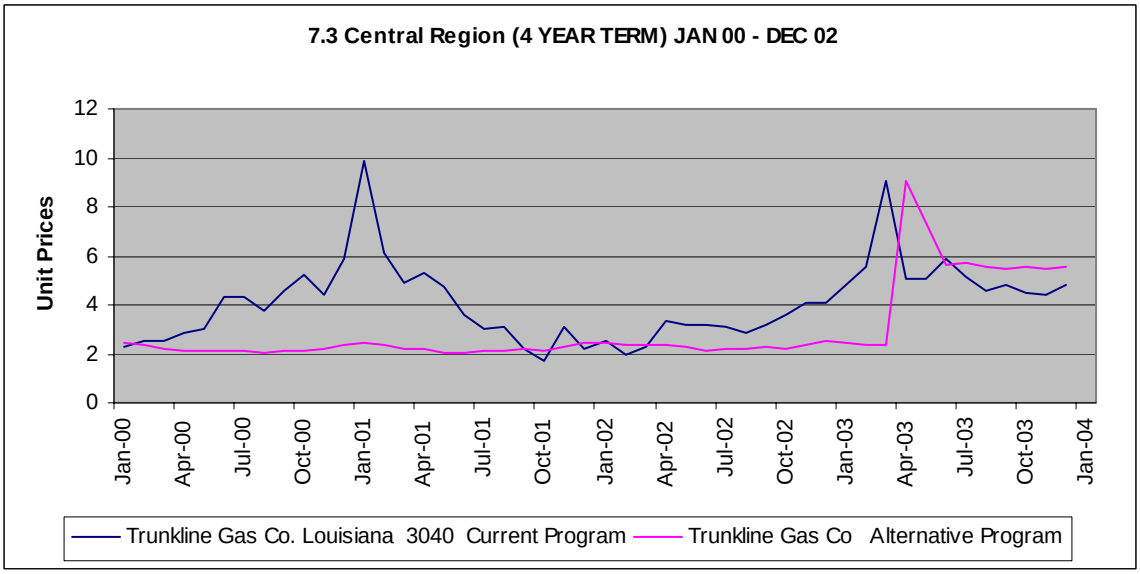


Table 17 Program 7.3 Central Region Model Comparison Trunkline Gas Co. Louisiana

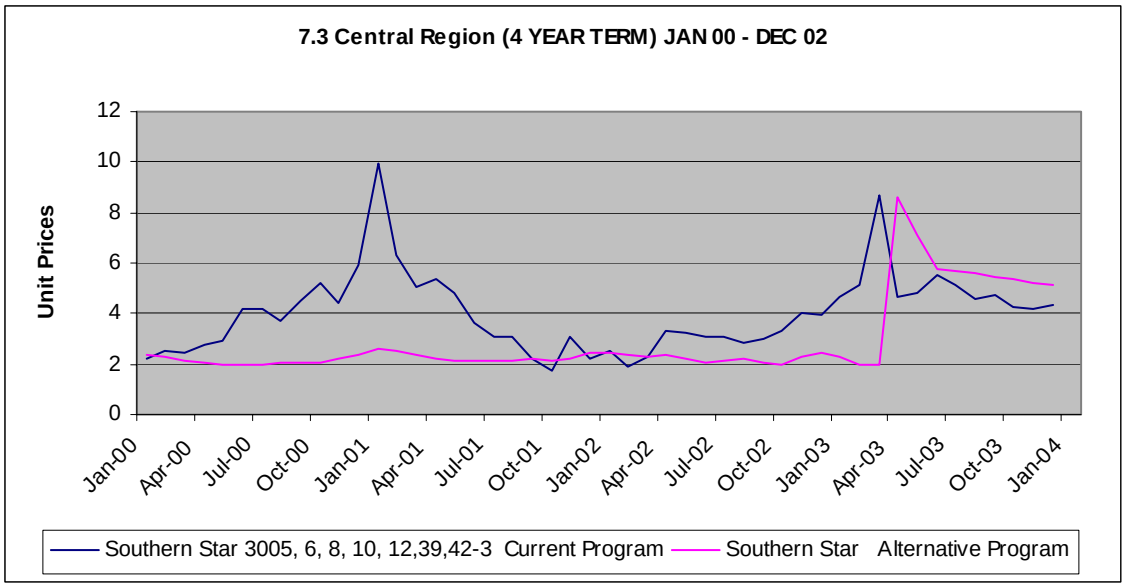


Table 18 Program 7.3 Central Region Model Comparison Southern Star

4. Program 7.4 the Western Region

The charts on pages 42 and 43 depict the fluctuations in pricing occurring month to month in each model. Over 80 percent of the time the alternative model outperformed the current one in month to month price comparison. The standard deviation in price for the alternative model for all of the installations pricing points ranged from a low of 35 cents to a high of two dollars and eighty-seven cents and for the current program it was one dollar and forty-eight cents to four dollars and twenty-six cents. As has been evident in all of the previous regions, use of the alternative approach to purchasing natural gas for a 3 year procurement cycle would have resulted in substantial cost avoidance for all of the installations in the current program. Savings during the winter months alone produce cost avoidance that supports the installations as they attempt to predict budgets and allocate their energy costs.

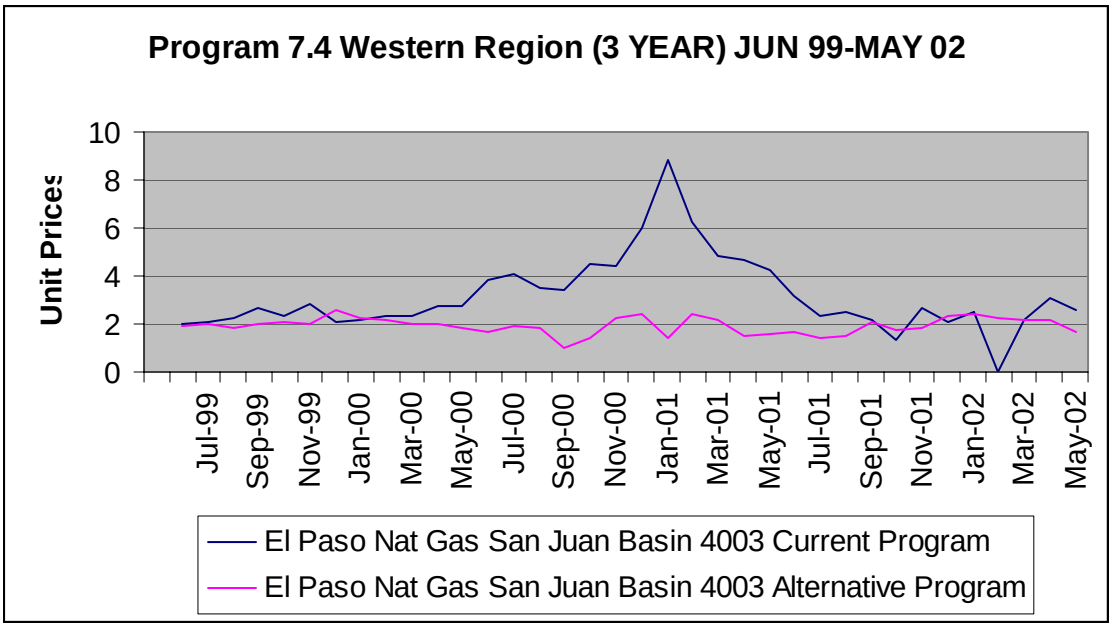


Table 19 Program 7.4 Western Region Model Comparison El Paso Nat Gas San Juan Basin

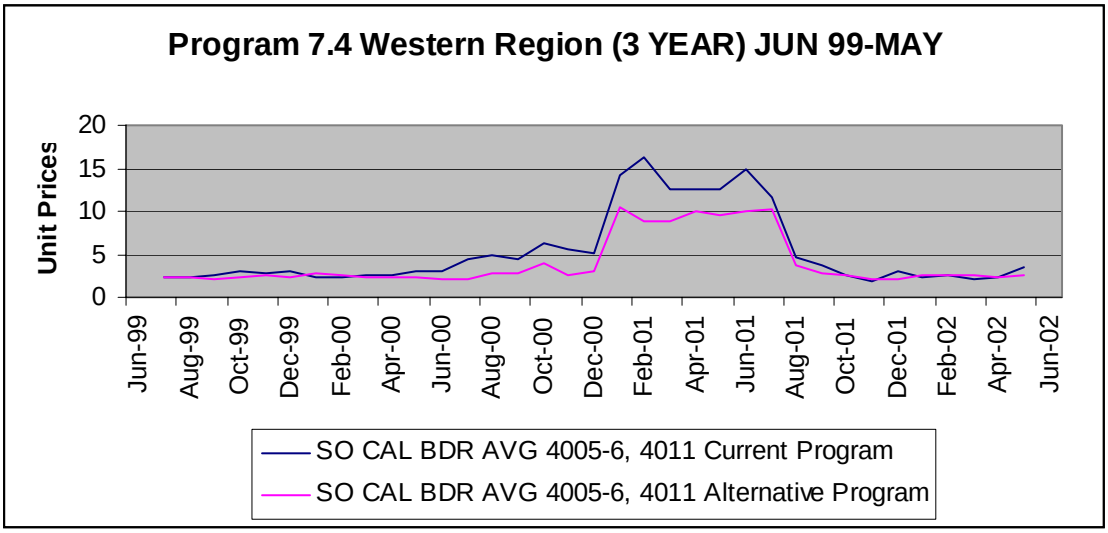


Table 20 Program 7.4 Western Region Model Comparison Southern California Border Average

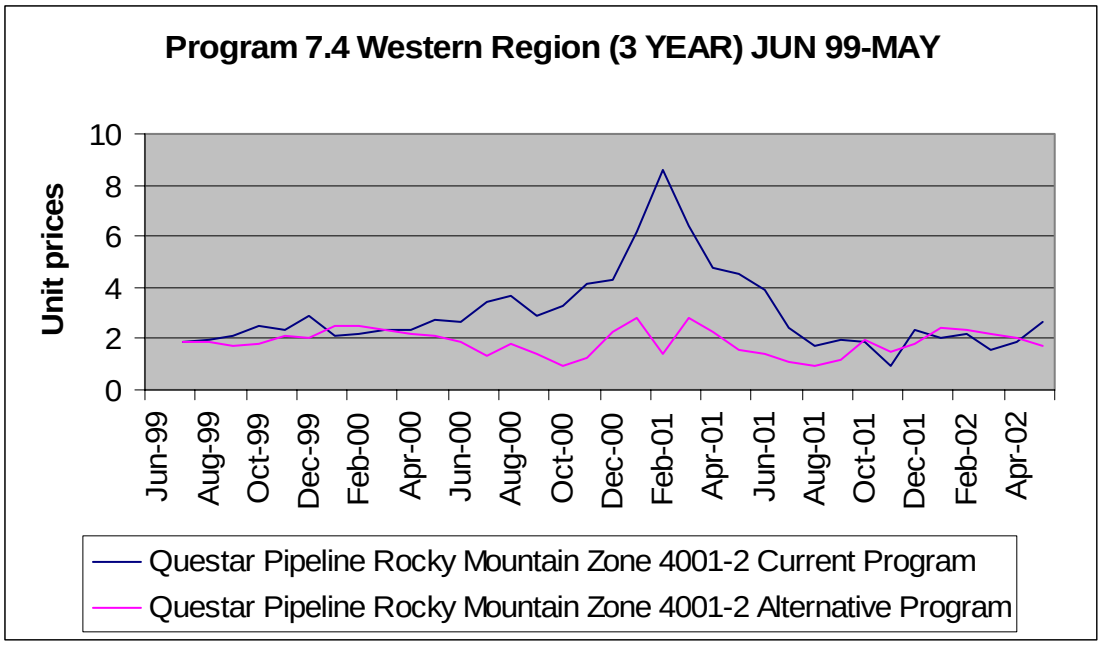


Table 21 Program 7.4 Western Region Model Comparison Questar Pipeline – Rocky Mountain Zone

The analysis of DESC's current method for the procurement of natural gas and the alternative model results in a definitive recommendation that DESC adopt this methodology for future procurement of a portion of it's natural gas requirements. In the next chapter I will provide recommendations for steps necessary to incorporate the diversified portfolio approach into DESC's natural gas purchase procedures and discuss the potential impacts to DESC, the installations and the marketers. Research questions will be answered and conclusions summarized.

THIS PAGE INTENTIONALLY LEFT BLANK

VII. CONCLUSIONS

A. PRICING MODELS

1. DESC Pricing Model

DESC enters into natural gas direct delivery contracts for three years utilizing pricing methodology to provide a monthly indexed price established by using Platts, Inside FERC's Gas Market Reports for the price of spot gas delivered to pipelines. Pricing data was retrieved from DESC's "Fuels Automated System" database for all installations and pricing points used to establish the current system pricing model.

2. Alternative Pricing Model

Time periods for purchases of natural gas was developed for each of the four procurement programs and pricing locations (Hubs). Historical NYMEX data was retrieved and a model was developed to simulate purchases of natural gas using firm fixed price contracts awarded for one, two, three and four year terms.

B. FINDINGS

The standard deviation in price for the alternative model was lower than the current model when all of the regions and all time periods were averaged. The alternative program price only deviated by approximately 88 cents compared to $1.66 for the current program. The findings for each region are as follows:

1. Northeast Region

I believe the northeastern region alternative program outperformed the other regions by the highest because it is the region with the greatest degree of price movement month to month. This region has the most stringent capacity restraints on pipeline delivery and the greatest degree of weather related variability. The current model, average of all of the pricing points, exhibited price variability of $1.56 while the alternative program was only 38 cents. This region above all others would benefit from use of the alternative model for it's acquisitions in the future.

2. Southern Region

The southern region alternative program outperformed the current program by the lowest percentage of all regions because the one year term is less susceptible to volatility in the pricing indices due to the markets ability to predict the prices 1 year out with more certainty that with the 2, 3 or 4 year terms.

3. Central Region

In the central region the current and alternative models exhibited the same degree of variability, when all pricing points' standard deviations were averaged, for both the current and alternative models it was $1.58. This may or may not be an anomaly in the alternative model some of the pricing data for the alternative model was derived from actual data in the current model due to the lack of complete data. It could represent how the models risk assessment in the data over the longest term; this was for 4 years, results in a smoothing effect over time. Although the same average variability in price exists, the alternative model still had lower prices overall.

4. Western Region

The western region achieved the second best results with the alternative program outperforming the current program, on average for all pricing points in the region, 85 percent of the time. The degree of variability for the alternative model was $1.24 compared to $2.42 for the current program. This represents the greatest differences in average prices for all of the programs.

C. RECOMMENDATIONS

Develop a procurement strategy for a pilot program to test the alternative model

- Do market research to determine ways to incorporate commercial best practices for purchasing firm fixed-price natural gas in DESC solicitations
  - Review other agency contracts
  - Survey private industry current marketers
- Develop a solicitation utilizing firm-fixed price procurement methodology
  - Research acquisition policy
  - Contract clauses
- Analyze results of pilot program and develop strategies for other regions

D. LIMITATIONS OF RESEARCH

This research was limited by the lack of complete data for all of the current model and alternative model procurement regions. The choice of regions to utilize the 1, 2, 3 and 4 year terms may have influenced the results.

E. FUTURE RESEARCH

Test each of the programs using different terms to determine if the results may have been different.

Table 22 Current and Alternative Model Program Measurement of Volatility

Program #	Contract Term	Location	Current Program AVG	Alt Program AVG	Current Program STD DEV	Alt Program STD DEV	% Months Alt Better Price
7.1 NE	2 YR	South Louisiana/Henry Hub	4.45	2.84	1.62	0.25	90%
		Tenn Gas Pipe Louisiana 500/800 Leg Avg	4.24	3.41	1.56	0.81	90%
		Texas Eastern Trans East Louisiana Zone	4.26	2.78	1.56	0.25	90%
		Texas Eastern Trans South Texas Zone	4.16	2.67	1.51	0.22	90%
7.2 South	1 YR	South Louisiana/Henry Hub	4.64	3.99	1.11	0.29	69%
		Tenn Gas Pipe Louisiana 500/800 Leg Avg	4.54	3.99	1.10	0.29	63%
		Tenn Gas Pipe Texas Zone 0	4.47	3.83	1.08	0.25	69%
		El Paso Nat Gas Permian Basin	4.36	3.73	1.01	0.33	69%
		El Paso Nat Gas San Juan Basin	3.92	3.29	0.94	0.51	71%
		Florida Gas Trans Co Zone 2	4.64	4.00	1.11	0.29	79%
		Reliant Energy Gas East	4.53	3.82	1.08	0.30	71%
		Reliant Energy Gas West	4.38	3.79	1.07	0.32	69%
		Southern Nat Gas Louisiana	4.59	3.96	1.11	0.29	69%
7.3 Central	4 YR	South Louisiana/Henry Hub	4.18	3.08	1.59	1.62	71%
		Citygate North Shore Gas Chicago Citygate	4.23	3.18	1.62	1.63	71%
		Colorado Interstate Gas Rocky Mtn	3.37	2.12	1.53	1.78	75%
		Nat Gas Pipe Co Am Mid-Continent	3.99	2.89	1.57	1.57	71%
		Northern Nat Gas Co TX, OK, KS	4.02	No Data	1.57	No Data	
		Panhandle Eastern Pipe TX, OK (Mainline)	4.01	2.22	1.56	1.30	85%
		Trunkline Gas Co. Louisiana	4.09	2.98	1.59	1.61	71%
		Southern Star (formerly Williams) TX, OK, KS	4.02	2.92	1.57	1.56	71%
7.4 West	3 YR	El Paso Nat Gas San Juan Basin	3.25	1.93	1.48	0.35	86%
		SO CAL BDR AVG	5.25	3.91	4.26	2.87	83%
		Questar Pipeline Rocky Mountain Zone	2.99	1.84	1.52	0.49	86%

APPENDIX A. INSTALLATIONS IN DESC NATURAL GAS PROGRAM

Line Item Number	Installation Name	Installation Location
Program 7.1 Northeast Region		
1004	Watervliet Arsenal	NY
1006	Dept. of Energy (DOE) Knolls Atomic Lab	NY
1007	Veterans Administration Med Ctr (VAMC) Lyons	NJ
1008	FCI McKean	PA
1009	DOE West Valley	NY
1011	Picatinny Arsenal	NJ
1012	Fort Lee	VA
1015	US Army Soldier Systems Center, Natick	MA
1018	New London SubBase	CT
1019	Westover Reserve Air Force Base (RAFB)	MA
1020	Hanscom Air Force Base (AFB)	MA
1022	Carlisle Barracks	PA
1024	Naval Station Newport	RI
1023	US Penitentiary Unicor Lewisburg US Penitentiary (USP) Lewisburg	PA
1027	Quonset Air National Guard Base	RI
1030	Portsmouth Naval Shipyard	NH
Program 7.2 South Region		
2002	Fort Hood, Naval Air Station (NAS) Ft. Worth NAS Fort Worth, Sheppard AFB Goodfellow AFB, Dyess AFB	TX
2004	McAlester Army Ammunition Plant (AAP)	OK
2006	Tinker AFB	OK
2007	DOE Pantex	TX
2008	Kirtland AFB, DOE Sandia	NM
2009	DOE Los Alamos	NM
2013	Naval Station Ingleside	TX
2014	VAMC Nashville	TN
2016	Lone Star AAP	TX
2017	Pine Bluff Arsenal	AR
2018	Tyndall AFB	FL
2019	NAS Jacksonville	FL
2020	Patrick AFB, Kennedy Space Center Cape Canaveral Air Station	FL

Line Item Number	Installation Name	Installation Location
2021	Fort Polk	LA
	NAS Pensacola	FL
2022	Charleston AFB	SC
2026	DOE Oakridge	TN
2031	Naval Sub Base Kings Bay	GA
	Fort Stewart, Federal Law Enforcement Agency	GA
	Post Offices – Brunswick Pool	GA
2032	Hunter Army Airfield	GA
	Harry Milton Kandel US Army Reserve Center (USARC)	GA
2033	Fort Gordon. Post Offices-Augusta Pool	GA
2034	Dobbins Army Reserve Base (ARB)	GA
	Post Offices – Atlanta Pool, North Metro Post Offices Atlanta Aggregated USARC, NAS Atlanta	
2036	Moody AFB, Post Offices –Valdosta Pool	GA
2037	Post Offices – Ex Atlanta SNG Pool, Carrollton USARC	GA
2038	Post Offices – Macon Pool, Macon USARC	GA
2039	Post Offices – Rome Pool, Thomas H. Glenn USARC	GA
2040	Little Rock AFB	AR
2044	Fort Huachuca	AZ

Program 7.3 Central Region

3002	National Geospatial-Intelligence Agency	MO
3004	Lake City AAP	MO
3005	Whiteman AFB	MO
3006	McConnell AFB	KS
3008	Fort Leavenworth	KS
3010	DOE Kansas City	MO
3012	Fort Riley	KS
3015	Rock Mountain Arsenal	CO
3016	Defense Financial Administrative Center (DFAS) (Denver)	CO
3017	DOE Rocky Flats	CO
3019	Schreiver AFB	CO
3020	National Center for Atmospheric Research	CO
	VAMC Grand Junction	
3021	DOE Mound Plant	OH
3022	Defense Supply Center, Columbus	OH
3023	DOE Fernald	OH

Line Item Number	Installation Name	Installation Location
3024	Fort Knox	KY
3026	General Services Administration (GSA) Detroit	MI
	Environmental Protection Agency (EPA)	MI
	VAMC Detroit (Ann Arbor)	
3027	VAMC Saginaw	MI
3028	Grissom ARB	IN
3030	Naval Training Center Great Lakes, Fort Sheridan	IL
3031	DOE Fermi	IL
3032	DOE Argonne	IL
3033	US Railroad Retirement Board	IL
3036	DFAS Columbus	OH
3039	VAMC Topeka & Wicheta	KS
3040	VAMC Marion	IL
3041	VAMC St. Louis, JB & JC Divisions	MO
3042	VAMC Kansas City	MO
3043	VAMC Leavenworth	KS
3044	Fort Leonard Wood	MO

Program Number 7.4 West Region

4003	Nellis AFB	NV
4005	NAS Lemoore, NAS Point Mugu , Port Hueneme	CA
	DFSP Norwalk, Marine Corps 29 Palms,	
	March ARB, Vandenberg AFB, Camp Roberts ARB,	
	NASA JPL, US Penitentiary Lompoc, Terminal Island,	
	Los Angeles ARB, VAMC Los Angeles and Sepulveda,	
	Marine Corps Base Barstow,	
	Federal Correction Center (FCC) Victorville	
4006	Terminal Island (CAT),	CA
	Federal Correctional Institute (FCI) Metro Detention Center	
4011	Public Works Center San Diego	CA

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B. INDEX PRICES FOR CURRENT PROGRAM AND ALTERNATIVE PROGRAM

Purchase Program 7.1 Northeast Region
2 year term - March 00 thru Feb 02, March 02 thru Feb 04

Pipe	**G**		**500-N, 800-I**		**M**		**AD**	
	Pipeline Name/SIP Zone		Tenn Gas Pipe		Texas Eastern Trans		Texas Eastern Trans	
	South Louisiana/Henry Hub		Louisiana 500/800 Leg Avg.		East Louisiana Zone		South Texas Zone	
	1001, 3,7-9,12,13,15-16,18,24-25, 27-28,30,32,46-47,51,53,55-58		1019-20, 10,481,052		1004-6, 1022		1011, 1023	
Month	Current Program	Alternative Program	Current Program	Alternative Program	Current Program	Alternative Program	Current Program	Alternative Program
Mar-00	2.79	2.60	2.56	2.52	2.56	2.55	2.52	2.51
Apr-00	3.04	2.62	2.83	2.65	2.82	2.56	2.78	2.52
May-00	3.26	2.63	3.03	2.76	3.03	2.58	2.98	2.53
Jun-00	4.57	2.65	4.32	3.39	4.32	2.60	4.25	2.53
Jul-00	4.46	2.67	4.29	3.39	4.3	2.61	4.23	2.54
Aug-00	3.89	2.69	3.74	3.13	3.75	2.61	3.7	2.55
Sep-00	4.74	2.69	4.52	3.50	4.55	2.62	4.46	2.53
Oct-00	5.5	2.72	5.19	3.85	5.2	2.63	5.13	2.56
Nov-00	4.83	2.85	4.42	3.52	4.42	2.77	4.34	2.69
Dec-00	6.36	2.98	5.92	4.31	5.91	2.87	5.83	2.79
Jan-01	10.79	3.00	9.82	6.17	9.82	2.91	9.62	2.71
Feb-01	6.65	2.85	6.13	4.12	6.08	2.71	5.8	2.43
Mar-01	5.42	2.71	4.91	3.55	4.92	2.60	4.71	2.39
Apr-01	5.77	2.60	5.28	3.79	5.28	2.53	5.16	2.41
May-01	5.17	2.56	4.79	3.55	4.79	2.48	4.7	2.39
Jun-01	3.91	2.57	3.62	3.00	3.65	2.49	3.58	2.42
Jul-01	3.31	2.58	3.09	2.76	3.11	2.53	3.05	2.47
Aug-01	3.23	2.58	3.09	2.74	3.1	2.49	3.04	2.43
Sep-01	2.43	2.59	2.22	2.34	2.23	2.53	2.19	2.49
Oct-01	1.96	2.63	1.75	2.16	1.79	2.56	1.77	2.54
Nov-01	3.44	2.75	3.08	2.85	3.11	2.70	3.05	2.64
Dec-01	2.28	2.88	2.2	2.49	2.23	2.83	2.19	2.79
Jan-02	2.61	2.91	2.53	2.64	2.53	2.83	2.49	2.79
Feb-02	2.23	2.79	1.96	2.31	1.97	2.73	1.93	2.69
Mar-02	2.55	2.39	2.32	2.31	2.32	2.32	2.31	2.31
Apr-02	3.54	2.39	3.32	2.79	3.33	2.32	3.29	2.28
May-02	3.44	2.45	3.26	2.78	3.27	2.40	3.21	2.34
Jun-02	3.54	2.51	3.27	2.78	3.28	2.37	3.23	2.32
Jul-02	3.32	2.56	3.17	2.78	3.18	2.47	3.13	2.42
Aug-02	2.93	2.61	2.87	2.65	2.88	2.52	2.83	2.47
Sep-02	3.3	2.62	3.18	2.82	3.18	2.53	3.14	2.49
Oct-02	3.72	2.66	3.64	3.03	3.61	2.55	3.56	2.50
Nov-02	4.13	2.92	4.05	3.44	4.07	2.86	4.04	2.83
Dec-02	4.13	3.16	4.07	3.56	4.08	3.11	4.04	3.07
Jan-03	4.96	3.27	4.82	3.83	4.91	3.22	4.67	2.98
Feb-03	5.66	3.21	5.59	4.25	5.63	3.18	5.47	3.02
Mar-03	9.11	3.12	9.07	5.95	9.15	3.16	8.94	2.95
Apr-03	5.14	2.99	5.05	3.78	5.07	2.92	4.85	2.70
May-03	5.12	3.01	5.03	3.84	5.06	2.95	4.89	2.78
Jun-03	5.95	3.06	5.86	4.32	5.88	2.99	5.76	2.87
Jul-03	5.3	3.10	5.19	4.02	5.23	3.03	5.12	2.92
Aug-03	4.69	3.14	4.56	3.72	4.63	3.08	4.49	2.94
Sep-03	4.93	3.14	4.81	3.84	4.87	3.08	4.73	2.94
Oct-03	4.44	3.16	4.33	3.60	4.37	3.09	4.24	2.96
Nov-03	4.45	3.32	4.38	3.71	4.41	3.28	4.27	3.14
Dec-03	4.86	3.50	4.81	3.97	4.83	3.47	4.65	3.29
Jan-04	6.15	3.60	6.08	4.57	6.12	3.57	5.84	3.29
Feb-04	5.77	3.51	5.7	4.19	5.75	3.49	5.32	3.06

Purchase Program 7.2 South Region
1 year term - Sep 00 thru Aug 01, Sep 01 thru Aug 02, Sep 02 thru Aug 03, Sep 03 thru Aug 04

PIPE	**G**		**500-N, 800-I**		**AB**		**AW**	
	Pipeline Name/SIP Zone		Tenn Gas Pipe		Tenn Gas Pipe		El Paso Nat Gas	
	South Louisiana/Henry Hub		Louisiana 500/800 Leg Avg.		Texas Zone 0		Permian Basin	
	2002,2020-21		2014, 2026		2013		2007	
	Current	Alternative	Current	Alternative	Current	Alternative	Current	Alternative
Month	Program	Program	Program	Program	Program	Program	Program	Program
Sep-00	4.61	4.62	4.52	4.62	4.48	4.48	4.50	4.50
Oct-00	5.29	4.64	5.19	4.64	5.15	4.50	5.15	4.50
Nov-00	4.49	4.70	4.42	4.70	4.37	4.57	4.52	4.72
Dec-00	6.03	4.77	5.92	4.77	5.87	4.62	6.27	5.02
Jan-01	9.93	4.72	9.82	4.72	9.67	4.48	9.81	4.62
Feb-01	6.25	4.47	6.13	4.47	6.01	4.26	6.65	4.90
Mar-01	5.01	4.21	4.91	4.21	4.86	4.04	5.12	4.30
Apr-01	5.35	3.95	5.28	3.95	5.25	3.85	5.31	3.91
May-01	4.86	3.85	4.79	3.85	4.76	3.74	4.91	3.89
Jun-01	3.73	3.83	3.62	3.83	3.61	3.71	3.82	3.92
Jul-01	3.19	3.81	3.09	3.81	3.11	3.76	3.21	3.86
Aug-01	3.18	3.82	3.09	3.82	3.07	3.70	3.09	3.72
Sep-01	2.34	2.30	2.22	2.30	2.21	2.21	2.33	2.33
Oct-01	1.84	2.39	1.75	2.39	1.73	2.26	1.63	2.16
Nov-01	3.14	2.68	3.08	2.68	3.03	2.55	2.79	2.31
Dec-01	2.28	2.99	2.20	2.99	2.16	2.87	2.35	3.06
Jan-02	2.60	3.13	2.53	3.13	2.52	3.04	2.57	3.09
Feb-02	2.05	3.10	1.96	3.10	1.90	2.97	1.83	2.90
Mar-02	2.41	3.03	2.32	3.03	2.29	2.93	2.18	2.82
Apr-02	3.43	2.94	3.32	2.94	3.30	2.84	3.18	2.72
May-02	3.40	2.96	3.26	2.96	3.20	2.84	3.12	2.76
Jun-02	3.42	3.00	3.27	3.00	3.23	2.81	2.86	2.44
Jul-02	3.29	3.05	3.17	3.05	3.15	2.92	3.16	2.93
Aug-02	3.00	3.10	2.87	3.10	2.85	2.97	2.72	2.84
Sep-02	3.29	3.29	3.18	3.29	3.17	3.19	3.05	3.07
Oct-02	3.71	3.40	3.64	3.40	3.56	3.24	3.27	2.95
Nov-02	4.15	3.67	4.05	3.67	4.02	3.56	3.88	3.42
Dec-02	4.13	3.92	4.07	3.92	4.01	3.80	3.91	3.70
Jan-03	4.93	4.04	4.82	4.04	4.73	3.81	4.63	3.71
Feb-03	5.68	3.98	5.59	3.98	5.42	3.74	4.93	3.25
Mar-03	9.16	3.90	9.07	3.90	8.89	3.68	7.71	2.50
Apr-03	5.15	3.77	5.05	3.77	4.92	3.55	4.54	3.17
May-03	5.14	3.78	5.03	3.78	4.91	3.57	4.79	3.45
Jun-03	5.97	3.79	5.86	3.70	5.79	3.63	5.48	3.32
Jul-03	5.30	3.81	5.19	3.81	5.13	3.64	5.18	3.69
Aug-03	4.72	3.83	4.56	3.72	4.55	3.69	4.47	
Sep-03	4.93	4.93	4.81	4.93	4.79	4.79	4.77	4.77
Oct-03	4.41	4.88	4.33	4.88	4.28	4.72	4.14	4.58
Nov-03	4.46	5.11	4.38	5.11	4.28	4.94	4.07	4.73
Dec-03	4.86	5.36	4.81	5.36	4.68	5.18	4.36	4.86
Jan-04	6.17	5.49	6.08	5.49	5.83	5.17	5.40	4.74
Feb-04	5.78	5.43	5.70	5.43	5.32	4.98	5.13	4.79
Mar-04	5.15	5.31	5.08	5.31	4.84	5.00	4.53	4.69
Apr-04	5.37	4.86	5.28	4.86	5.19	4.68	4.67	4.16
May-04	5.95	4.77	5.86	4.77	5.79	4.62	5.32	4.15
Jun-04	6.71	4.77	6.61	4.77	6.53	4.62	6.19	4.28
Jul-04	6.17	4.78	6.07	4.78	6.02	4.66	5.94	4.58
Aug-04	6.07	4.79	5.94	4.79	5.90	4.65	5.68	4.43

Purchase Program 7.2 South Region

1 year term - Sep 00 thru Aug 01, Sep 01 thru Aug 02, Sep 02 thru Aug 03, Sep 03 thru Aug 04

PIPE	**AX**		**E**		**AI**		**AJ**		**K**	
	El Paso Nat Gas		Florida Gas Trans Co		Reliant Energy Gas		Reliant Energy Gas		Southern Nat Gas	
	San Juan Basin		Zone 2		East*		West*		Louisiana	
	2008-9, 2044		2018-20, 2045		2016-17, 2040		2004-5		2022, 2031-2034, 2036-39	
	Current	Alternative	Current	Alternative	Current	Alternative	Current	Alternative	Current	Alternative
Month	Program	Program	Program	Program	Program	Program	Program	Program	Program	Program
Sep-00	3.45	3.45	4.61	4.59	4.52	4.52	4.47	4.47	4.59	4.59
Oct-00	4.53	3.88	5.29	4.67	5.21	4.56	5.18	4.53	5.24	4.59
Nov-00	4.41	4.61	4.49	4.74	4.43	4.63	4.39	4.59	4.47	4.67
Dec-00	6.00	4.75	6.03	4.77	5.89	4.64	5.89	4.64	6.01	4.76
Jan-01	8.80	3.61	9.93	4.79	9.81	4.62	9.86	4.67	9.89	4.70
Feb-01	6.24	4.49	6.25	4.54	6.16	4.41	6.12	4.37	6.27	4.52
Mar-01	4.83	4.01	5.01	4.17	4.92	4.10	4.87	4.05	4.98	4.16
Apr-01	4.65	3.25	5.35	3.98	5.30	3.90	5.28	3.88	5.33	3.93
May-01	4.23	3.21	4.86	3.84	4.80	3.78	4.75	3.73	4.84	3.82
Jun-01	3.14	3.24	3.73	3.83	3.64	3.74	3.60	3.70	3.70	3.80
Jul-01	2.34	2.99	3.19	3.83	3.07	3.72	3.04	3.69	3.13	3.78
Aug-01	2.46	3.09	3.18	3.80	3.11	3.74	3.08	3.71	3.13	3.76
Sep-01	2.18	2.18	2.34	2.30	2.23	2.23	2.20	2.20	2.31	2.31
Oct-01	1.34	1.87	1.84	2.36	1.75	2.28	1.71	2.24	1.76	2.29
Nov-01	2.69	2.21	3.14	2.73	3.07	2.59	3.04	2.56	3.11	2.63
Dec-01	2.09	2.80	2.28	3.02	2.20	2.91	2.12	2.83	2.23	2.94
Jan-02	2.47	2.99	2.60	3.08	2.51	3.03	2.46	2.98	2.54	3.06
Feb-02	1.77	2.84	2.05	3.08	1.92	2.99	1.87	2.94	1.99	3.06
Mar-02	2.13	2.77	2.41	3.02	2.30	2.94	2.25	2.89	2.37	3.01
Apr-02	3.10	2.64	3.43	3.01	3.31	2.85	3.26	2.80	3.36	2.90
May-02	2.58	2.22	3.40	2.96	3.23	2.87	3.19	2.84	3.31	2.95
Jun-02	2.12	1.70	3.42	3.00	3.23	2.81	3.16	2.67	3.35	2.93
Jul-02	2.70	2.47	3.29	3.05	3.17	2.94	3.07	2.86	3.22	2.99
Aug-02	2.46	2.58	3.00	3.10	2.87	2.99	2.83	2.94	2.90	3.02
Sep-02	2.30	2.32	3.29	3.31	3.18	3.20	3.03	3.29	3.23	3.25
Oct-02	2.34	2.02	3.71	3.39	3.51	3.19	3.38	3.09	3.66	3.34
Nov-02	3.35	2.89	4.15	3.69	4.02	3.56	4.00	3.54	4.09	3.63
Dec-02	3.64	3.43	4.13	3.92	3.96	3.75	3.93	3.75	4.41	3.89
Jan-03	4.47	3.55	4.93	4.01	4.60	3.68	4.57	4.07	4.89	3.97
Feb-03	4.58	2.90	5.68	4.00	5.35	3.67	5.20	3.98	5.62	3.94
Mar-03	5.91	0.70	9.16	3.95	8.75	3.45	8.67	3.92	9.12	3.91
Apr-03	3.71	2.34	5.15	3.78	4.88	3.51	4.69	3.78	5.05	3.68
May-03	4.03	2.69	5.14	3.80	4.97	3.63	4.90	3.78	5.07	3.73
Jun-03	5.03	2.87	5.97	3.81	5.77	3.61	5.53	3.37	5.87	3.71
Jul-03	4.70	3.21	5.30	3.81	5.19	3.70	5.18	3.60	5.37	3.88
Aug-03	4.03	3.17	4.72	3.86	4.64	3.78	4.56	3.70	4.62	3.76
Sep-03	4.44	4.44	4.93	4.93	4.86	3.78		3.70	4.88	4.88
Oct-03	3.95	4.39	4.41	4.85	4.44	4.86	4.31	4.75	4.38	4.82
Nov-03	3.96	4.62	4.46	5.12	4.45	4.84	4.16	4.82	4.10	5.07
Dec-03	4.23	4.73	4.86	5.36	4.86	5.01	4.45	4.95	4.82	5.32
Jan-04	5.13	4.47	6.17	5.51	6.15	5.16	5.62	5.03	6.16	5.50
Feb-04	5.01	4.67	5.78	5.44	5.77	5.07	5.27	4.88	5.75	5.41
Mar-04	4.40	4.56	5.15	5.31	5.15	5.06	4.69	4.85	5.12	5.28
Apr-04	4.46	3.95	5.37	4.86	5.37	4.66	4.97	4.48	5.32	4.81
May-04	5.06	3.89	5.95	4.78	5.94	4.53	5.43	4.33	5.89	4.72
Jun-04	5.71	3.80	6.71	4.80	6.68	4.56	6.10	4.27	6.66	4.75
Jul-04	5.49	4.13	6.17	4.81	6.14	4.64	5.80	4.44	6.16	4.80
Aug-04	5.39	4.14	6.07	4.82	6.04	4.67	5.68	4.60	6.00	4.75

Purchase Program 7.3 Central Region
4 year term - Jan 00 thru Dec 03, Jan 04 thru Dec 07

	Pipeline Name/SIP Zone							
	South Louisiana/Henry Hub		Citygate North Shore Gas Chicago Citygate		Colorado Interstate Gas Rocky Mtn		Nat Gas Pipe Co Am Mid-Continent	
	3021-24, 3036		3030		3015-17		3031-33	
Month	Current Program	Alternative Program	Current Program	Alternative Program	Current Program	Alternative Program	Current Program	Alternative Program
Jan-00	2.36	2.47	2.22	2.55	2.15	2.26	2.22	2.33
Feb-00	2.61	2.39	2.47	2.46	2.34	2.12	2.47	2.25
Mar-00	2.61	2.28	2.46	2.32	2.31	1.98	2.46	2.13
Apr-00	2.88	2.17	2.77	2.22	2.65	1.94	2.77	2.06
May-00	3.08	2.14	2.93	2.18	2.61	1.67	2.93	1.99
Jun-00	4.37	2.15	4.19	2.23	3.62	1.40	4.19	1.97
Jul-00	4.36	2.16	4.18	2.23	3.86	1.66	4.18	1.98
Aug-00	3.83	2.17	3.68	2.24	3.04	1.38	3.68	2.02
Sep-00	4.62	2.17	4.46	2.19	3.36	0.91	4.46	2.01
Oct-00	5.29	2.19	5.17	2.34	4.19	1.09	5.17	2.07
Nov-00	4.50	2.32	4.39	2.43	4.31	2.13	4.39	2.21
Dec-00	6.02	2.46	5.86	2.59	5.95	2.39	5.86	2.30
Jan-01	9.91	2.51	9.92	3.53	8.63	1.23	9.92	2.52
Feb-01	6.22	2.43	6.16	2.73	6.31	2.52	6.16	2.37
Mar-01	5.03	2.34	4.97	2.58	4.72	2.03	4.97	2.28
Apr-01	5.35	2.24	5.28	2.49	4.49	1.38	5.28	2.17
May-01	4.87	2.21	4.76	2.37	3.91	1.25	4.76	2.10
Jun-01	3.73	2.22	3.60	2.33	2.43	0.92	3.60	2.09
Jul-01	3.16	2.22	3.00	2.24	1.75	0.81	3.00	2.06
Aug-01	3.19	2.23	3.04	2.23	2.03	1.07	3.04	2.08
Sep-01	2.34	2.24	2.19	2.28	1.98	1.92	2.19	2.13
Oct-01	1.86	2.26		2.27	1.05	1.45	1.70	2.10
Nov-01	3.16	2.33		2.38	2.54	1.71	3.04	2.21
Dec-01	2.28	2.52	2.42	2.66	2.13	2.37	2.23	2.47
Jan-02	2.61	2.57	2.69	2.65	2.26	2.22	2.49	2.45
Feb-02	2.03	2.49	2.04	2.50	6.31	2.16	1.89	2.35
Mar-02	2.39	2.40	2.41	2.42	4.72	1.86	2.28	2.29
Apr-02	3.40	2.44	3.42	2.46	2.71	1.75	3.28	2.32
May-02	3.36	2.37	3.42	2.47	2.18	1.23	3.17	2.22
Jun-02	3.37	2.37	3.37	2.32	1.56	0.51	3.04	1.99
Jul-02	3.26	2.36	3.27	2.36	1.20	0.29	3.00	2.09
Aug-02	2.95	2.36	2.90	2.34	1.59	0.98	2.73	2.12
Sep-02	3.27	2.36	2.91	2.29	1.09	0.18	2.95	2.04
Oct-02	3.72	2.37	3.67	2.32	1.20	-0.15	3.31	1.96
Nov-02	4.13	2.39	4.36	2.62	2.96	1.22	4.03	2.29
Dec-02	4.13	2.59	4.24	2.70	3.33	1.79	3.98	2.44
Jan-03	4.96	2.62	5.01	2.65	3.14	0.80	4.61	2.27
Feb-03	5.66	2.54	5.57	2.45	3.20	0.08	5.05	1.93
Mar-03	9.11	2.46	9.32	2.67	5.01	-1.64	8.64	1.99
Apr-03	5.14	9.13	5.23	9.22	3.21	7.20	4.70	8.69
May-03	5.12	7.39	5.24	7.51	3.85	6.12	4.74	7.01
Jun-03	5.96	6.23	5.92	6.19	4.87	5.15	5.49	5.77
Jul-03	5.30	5.81	5.45	5.99	4.61	5.12	5.02	5.53
Aug-03	4.69	5.70	4.69	5.70	3.95	4.96	4.47	5.48
Sep-03	4.93	5.60	5.03	5.69	4.31	4.98	4.79	5.46
Oct-03	4.44	5.50	4.64	5.69	4.01	5.07	4.30	5.36
Nov-03	4.45	5.49	4.67	5.70	3.87	4.91	4.24	5.28
Dec-03	4.86	5.65	4.93	5.72	4.44	5.23	4.47	5.26

Purchase Program 7.3 Central Region

4 year term - Jan 00 thru Dec 03, Jan 04 thru Dec 07

	Pipeline Name/SIP Zone							
	Northern Nat Gas Co		Panhandle Eastern Pipe		Trunkline Gas Co.		Southern Star (formerly Williams	
	TX, OK, KS		TX, OK (Mainline)		Louisiana		TX, OK, KS	
	3004		3026		3040		3005-6,8,10,12.39,42,43	
	Current	Alternative	Current	Alternative	Current	Alternative	Current	Alternative
Month	Program	Program	Program	Program	Program	Program	Program	Program
Jan-00	2.25	2.31	2.26	2.37	2.3	2.41	2.25	2.36
Feb-00	2.49	2.23	2.5	2.28	2.56	2.34	2.49	2.27
Mar-00	2.47	2.11	2.48	2.15	2.54	2.21	2.47	2.14
Apr-00	2.79	2.02	2.79	2.08	2.82	2.11	2.79	2.08
May-00	2.94	1.92	2.94	2.00	3.03	2.09	2.94	2.00
Jun-00	4.19	1.90	4.21	1.99	4.35	2.13	4.19	1.97
Jul-00	4.2	1.96	4.2	2.00	4.29	2.09	4.2	2.00
Aug-00	3.69	2.00	3.7	2.04	3.74	2.08	3.69	2.03
Sep-00	4.5	1.99	4.49	2.04	4.54	2.09	4.5	2.05
Oct-00	5.19	1.98	5.19	2.09	5.2	2.10	5.19	2.09
Nov-00	4.43	2.18	4.41	2.22	4.42	2.24	4.43	2.25
Dec-00	5.9	2.33	5.88	2.32	5.91	2.35	5.9	2.34
Jan-01	9.98	2.35	9.92	2.52	9.84	2.44	9.98	2.58
Feb-01	6.29	2.37	6.22	2.43	6.13	2.34	6.29	2.50
Mar-01	5.03	2.29	5.01	2.32	4.86	2.17	5.03	2.34
Apr-01	5.34	2.15	5.31	2.20	5.29	2.18	5.34	2.23
May-01	4.82	2.02	4.82	2.16	4.71	2.05	4.82	2.16
Jun-01	3.66	1.98	3.65	2.14	3.57	2.06	3.66	2.15
Jul-01	3.05	1.95	3.05	2.11	3.03	2.09	3.05	2.11
Aug-01	3.1	1.95	3.08	2.12	3.09	2.13	3.1	2.14
Sep-01	2.24	2.03	2.24	2.18	2.24	2.18	2.24	2.18
Oct-01	1.75	2.03	1.75	2.15	1.74	2.14	1.75	2.15
Nov-01	3.05	2.11	3.05	2.22	3.08	2.25	3.05	2.22
Dec-01	2.24	2.32	2.24	2.48	2.23	2.47	2.24	2.48
Jan-02	2.51	2.36	2.51	2.47	2.49	2.45	2.51	2.47
Feb-02	1.9	2.32	1.9	2.36	1.93	2.39	1.9	2.36
Mar-02	2.31	2.18	2.3	2.31	2.32	2.33	2.31	2.32
Apr-02	3.29	2.23	3.29	2.33	3.33	2.37	3.29	2.33
May-02	3.2	2.15	3.18	2.23	3.2	2.25	3.2	2.25
Jun-02	3.08	1.85	3.02	1.97	3.2	2.15	3.08	2.03
Jul-02	3.08	2.07	3	2.09	3.13	2.22	3.08	2.17
Aug-02	2.84	2.00	2.7	2.09	2.84	2.23	2.84	2.23
Sep-02	2.98	1.92	2.97	2.06	3.17	2.26	2.98	2.07
Oct-02	3.32	1.77	3.34	1.99	3.59	2.24	3.32	1.97
Nov-02	4.06	2.22	4.05	2.31	4.08	2.34	4.06	2.32
Dec-02	3.98	2.36	3.97	2.43	4.06	2.52	3.98	2.44
Jan-03	4.62	2.18	4.58	2.24	4.78	2.44	4.62	2.28
Feb-03	5.12	1.98	5.07	1.95	5.52	2.40	5.12	2.00
Mar-03	8.67	1.94	8.55	1.90	9.04	2.39	8.67	1.94
Apr-03	4.63	8.61	4.64	8.63	5.06	9.05	4.63	8.62
May-03	4.83	6.99	4.81	7.08	5.05	7.32	4.83	7.10
Jun-03	5.52	5.69	5.58	0.28	5.85	5.64	5.52	5.80
Jul-03	5.17		5.18	0.51	5.18	5.69	5.17	5.68
Aug-03	4.57		4.55	1.01	4.58	5.59	4.57	5.58
Sep-03	4.77		4.83	0.67	4.84	5.51	4.77	5.44
Oct-03	4.29		4.34	1.06	4.5	5.56	4.29	5.35
Nov-03	4.18		4.24	1.04	4.4	5.44	4.18	5.22
Dec-03	4.38		4.42	0.78	4.79	5.58	4.38	5.17

Purchase Program 7.4 Western Region
3 year term - JUN 99 thru May 02

	Pipeline Name/SIP Zone					
	El Paso Nat Gas		SO CAL BDR AVG		Questar Pipeline	
	San Juan Basin		4005-6, 4011		Rocky Mountain Zone	
	4003				4001-2	
	Current	Alternative	Current	Alternative	Current	Alternative
Month	Program	Program	Program	Program	Program	Program
Jun-99	1.96	1.96	2.22	2.22	1.85	1.85
Jul-99	2.05	1.98	2.38	2.31	1.92	1.85
Aug-99	2.26	1.88	2.58	2.20	2.12	1.74
Sep-99	2.63	1.99	2.93	2.29	2.48	1.84
Oct-99	2.37	2.12	2.71	2.46	2.34	2.09
Nov-99	2.84	2.03	3.07	2.26	2.86	2.01
Dec-99	2.08	2.58	2.37	2.87	2.10	2.49
Jan-00	2.18	2.29	2.38	2.49	2.19	2.47
Feb-00	2.36	2.14	2.55	2.33	2.38	2.31
Mar-00	2.37	2.04	2.59	2.26	2.35	2.16
Apr-00	2.75	2.04	3.02	2.31	2.7	2.09
May-00	2.78	1.84	3.03	2.09	2.62	1.85
Jun-00	3.87	1.65	4.33	2.11	3.41	1.36
Jul-00	4.12	1.92	4.91	2.71	3.66	1.76
Aug-00	3.5	1.84	4.49	2.83	2.92	1.42
Sep-00	3.45	1.00	6.31	3.86	3.25	0.97
Oct-00	4.53	1.43	5.57	2.47	4.17	1.25
Nov-00	4.41	2.23	5.18	2.95	4.28	2.29
Dec-00	6	2.44	14.08	10.52	6.14	2.78
Jan-01	8.8	1.40	16.32	8.92	8.58	1.38
Feb-01	6.24	2.45	12.63	8.84	6.42	2.82
Mar-01	4.83	2.14	12.58	9.89	4.79	2.27
Apr-01	4.65	1.54	12.56	9.45	4.5	1.55
May-01	4.23	1.57	14.94	9.90	3.87	1.37
Jun-01	3.14	1.63	11.7	10.19	2.42	1.06
Jul-01	2.34	1.40	4.7	3.77	1.74	0.96
Aug-01	2.46	1.50	3.74	2.78	1.99	1.18
Sep-01	2.18	2.12	2.65	2.59	1.88	1.96
Oct-01	1.34	1.74	1.76	2.16	0.95	1.52
Nov-01	2.69	1.86	2.95	2.12	2.38	1.77
Dec-01	2.09	2.33	2.27	2.51	2.02	2.43
Jan-02	2.47	2.43	2.62	2.58	2.19	2.32
Feb-02		2.23	2.02	2.48	1.6	2.22
Mar-02	2.13	2.14	2.28	2.29	1.85	2.01
Apr-02	3.1	2.14	3.41	2.45	2.67	1.71
May-02	2.58	1.63	3.19	2.24	2.09	1.19

BIBLIOGRAPHY

Catalyst Financial Group, Inc., "Federal Financing: The Federal Market Opportunity and Your Company," online: www.catalyst-financial.com/govtfed.html accessed: September 5, 2002

Finch, James E., Ph.D, The Essentials of Marketing Principles, Piscataway, New Jersey: Research & Education Association, 2001

Pace Global Energy Services: White Paper Fuel Portfolio Structuring, online: www.paceglobal.com/paceglobal/whitepapers/fuelwp.pdf accessed: May 2003

Pace Global Energy Services: White Paper Introduction to Risk Management, online: www.paceglobal.com/paceglobal/whitepapers/riskmanwp.pdf accessed: May 2003

Paulson, S. Lawrence, "From the Ground Up, America's Natural Gas Supply Challenge", American Gas, pp. 26-30, February 2003

Payne, F. William, Users Guide to Natural Gas Purchasing and Risk Management, Upper Saddle River, New Jersey, The Fairmont Press, Inc., 2000

Porter, Michael E., Competitive Strategy Techniques for Analyzing Industries and Competitors, New York, NY: The Free Press, 1980

U. S. Department of Energy, Energy Information Administration, Table 1.13, U.S. Government Energy Consumption by Agency and Source, Fiscal Years 1991 and 2001, online: www.eia.doe.gov/emeu/aer/txt/ptbo113.html accessed: January 21, 2003

U. S. Department of Energy, Natural Gas Strategic Plan

U.S. Department of Defense, Defense Energy Program Policy Memorandum, DoD 4140.25-M Vol. III, As of 12 June 2002

U.S. Department of Defense, Defense Logistics Agency, Defense Energy Support Center, Purchase Order SP0600-00-D-5017, Delivery Order 0013, Alternative Electricity and Natural Gas Procurement Strategies For U.S. Department of Defense Installations, Exeter Associates, Inc. pp. 1-28, July 2001

U.S. Department of Defense, DOD Energy Strategy, What is the appropriate "end-state" goal for the DoD Energy Program?, online: www.acq.osd.mil/installation/vision2020forum/issuepapers/vision2020%20Energy%20R3.doc, accessed May 2003

U.S. Federal Energy Regulatory Commission, 2003 Natural Gas Market Assessment, Winter 2002-03

THIS PAGE INTENTIONALLY LEFT BLANK

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center
   Fort Belvoir, Virginia

2. Dudley Knox Library
   Naval Postgraduate School
   Monterey, California

3. Roxanne Zolin
   Naval Postgraduate School
   Monterey, California

4. Nayantara Hensel
   Naval Postgraduate School
   Monterey, California

5. Kevin Ahern
   Defense Energy Support Center
   Director, Installation Energy

6. Pamela Griffith
   Defense Energy Support Center
   Deputy Director, Installation Energy